UPM-Kymmene Miramichi Inc. –
Nepisiguit License #2

Forest Management Plan

2002-2026

103-05453/

THE NEPISIGUIT LICENSE # 2
2002-2081 FOREST MANAGEMENT PLAN

UPM

Prepared By: UPM-Kymmene Miramichi Inc.

January 29, 2002

UPM

UPM-Kymmene Miramichi Inc.

Department of Natural Resources & Energy
Wayne Clowater, Regional Resources Manager
P.O. Box 170
Bathurst, New-Brunswick
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January 29, 2001
Woodlands / Pierre Lebel / PL

Subject: The Nepisiguit License #2 Spatial Forest Management Plan

Dear Wayne,

Please find herewith our revised proposal of the 2002 Spatial Forest Management Plan for License 2. As requested by your Department, this revised version includes the following modifications;

- as agreed with DNR&E, the shape, period or management activity of some harvest blocks have been changed;
- the blocking as proposed in the Middle River and Nigadoo River watersheds has been modified in order to comply with the *Watershed Protected Area Designation Order* of the *Clean Water Act;*
- existing and future blueberry leases have been included in the blocking;
- the blocking plan has been presented to the Popple Depot Forest Ecosystem Design Committee;
- a meeting was held with the License 2, Forest Management Consultation Committee;
- all stands contributing to SP in Eco-Regions 1 and 2, THSW in all Eco-Regions, OTHH in Eco-Region 3 and LMWH in Eco-Region 2 were identified on the blocking maps;
- all other topics as discussed and agreed with your staff on October 22, 2001 (see meeting minutes) are included in this revision.

For the next 50 years, the General Forest Spruce, Fir and Jack Pine AAC has been set to 256 614 m^3/yr The Hardwood and Poplar AAC have been set to 89 386 m^3/yr and 26 545 m^3/yr respectively for a total Hardwood AAC of 115 931 m^3/yr In 50 years, the Softwood and Hardwood AAC will increase to 392 673 m^3/yr (+ 53%) and 222 991 m^3/yr (+ 92%) respectively.

In comparison with 1997, the period 1 Spruce, Fir and Jack Pine AAC for all landbases decreased by 7.1% (20 729 m^3/yr). New forest inventory and yield curves has resulted in a 14.3% (16 004 m^3/yr) increase in the Hardwood AAC (Hardwood + Poplar).

In the General Forest, the level of full and fill planting have been set to 650 and 100 ha/yr respectively. Pre-commercial thinning levels have been set to 367 ha/yr of softwood, 632 ha/yr of mixedwood and 298 ha/yr of hardwood for a grand total of 1297 ha/yr In comparison with 1997, planting level increased by 25 % and pre-commercial level by 17%.

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AAC Reduction:

Early on in the management planning exercise it was soon realized the provincial Spruce, Fir & Jack Pine AAC was going to decrease significantly. On Crown License 2 a 7.1% reduction in Softwood AAC can be attributed to many factors;

- **Net Down:** In 1997 a net down factor of 6% was applied on the General Forest Spruce, Fir and Jack Pine AAC in order to help mitigate unmarked brooks, streams, wet and inoperable areas not characterized in the GIS.
    - Analysis done on the past 3 years (see letter sent to Blair Vessie on Dec. 13, 2001), has revised the net down factor to 10%, an additional 3% AAC reduction.
    - As requested by DNR&E, the net down has been applied to all restricted landbases and product (softwood and hardwood).
    - As per in the 1997 plan, blocking was done manually, therefore, no "squaring-up" net-down cost had to be applied.

- **Protected Areas:** The Jacquet River and Central Highlands Protected Areas (PA) represent 13 062 ha on Crown License 2. Without PA designation, 7 135 ha of this landbase would have been considered "General Forest".
    - In order to calculate the impact of this strategy on the General Forest Spruce, Fir & Jack Pine AAC, a gross estimate of 1.5m^3/yr/ha was used. It is estimated that designation of those areas will permanently remove 10 702 m^3/yr of sustainable AAC from future wood supply analysis.
    - Additional volume has also been lost from the potential management of other restricted areas within the Protected Areas.
    - The impact of the PAS is only partially mitigated in management periods 1 and 2 with 7 373 m^3/yr and 8 009 m^3/yr of softwood volume scheduled for harvesting in the Jacquet River Protected Area. After management period 2, no harvesting is permitted in the Jacquet River PA and 10 702 m^3/yr AAC (which represents 4% of the 1997 AAC) cannot be factored into future wood supply analysis for License 2.

- **Productive Landbase:** In 1997, the License 2 landbase (timber productive forest) was 242 284 ha. For this Management Plan, the productive landbase has been reduced to 240 797 ha.
    - Using a gross estimate of 1.5 m^3/yr/ha and assuming most of the area was previously a component of the General Forest, 2 230 m^3/yr of Spruce, Fir and Jack Pine AAC has been eliminated (0.8% of the 1997 AAC).

- To meet the new Eco-Region requirements for OSFH, most existing OSFH blocks required revision and in some cases were completely moved. As a result, the OSFH landbase is now 3 474 ha larger than it was in 1997.
- The Inoperable, DWA and Buffer landbases have been revised and in most cases increased.

- **Commercial Thinning:** In comparison with 1997 and as requested by the DNR&E, our commercial thinning has been modeled with a more conservative approach.

Provincial Committee on AAC Reduction:

With a provincial decrease in AAC looming a committee was established involving all Licensees and DNR&E Senior Management Staff. This committee explored means of increasing the Licensee AAC's across the province. This exercise resulted in eight suggestions made by DNR&E and 3 by the Licensees.

DNR&E Suggestions:

1. **Incorporating Genetic Gain:** This is based on the understanding that plantations established after a certain year will produce more volume due to improved seedling stock produced through the work of NBTIC. On License 2, genetic gain has been incorporated since the non-spatial level.

2. **Maximizing Harvest Possibilities in Watercourse Buffers:** It is felt harvesting opportunities in buffers on License 2 is very limited. The nature of forest, predominantly mature to over-mature balsam fir, does not lend itself to buffer harvesting prescriptions. However, UPM-Kymmene Miramichi Inc. realizes some buffer areas present harvesting and management opportunities and they are represented by a small volume in this Management Plan.

3. **Maximizing Harvest Possibilities in Deer Wintering Areas:** In comparison with the 1997 plan, the proposed softwood volume to be harvested from DWA has been increased by 25%.

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4. **Maximizing Harvest Possibilities in OSFH Blocks:** As per the buffer landbase, the volume available from OSFH blocks is limited. It is not possible to meet Net OSFH objectives for two Eco-Regions. The overall habitat situation per block and License wide is very tight for the first few periods. New openings or road construction may jeopardize the actual and future blocks structure and may also limit any future adjustment required by new inventory, ages or yield information.

5. **Reducing the Net-Down Factor:** As originally discussed with DNR&E, a reduction of the Net-down factor from 10% to 7 or 8% was contemplated. Additional analysis has shown 10% is the proper number to use.

6. **Reducing the Stand-Based Blocking Net-down:** Blocking was done manually, therefore, a factor was not applied on License 2.

7. **Manipulating the Hardwood Flow:** No gains were expected from manipulating the hardwood flow on License 2.

8. **Additional Harvesting in "Inoperable Areas":** For the first time on License 2, 1000 m^3/yr of Spruce, Fir and Jack Pine has been scheduled for harvesting in steep slopes.

Licensee Suggestions:

1. **Allow Cut Effect from More Tree Planting:** Planting levels on License 2 have increased by 25%. It is believed that increase in planting mitigated the AAC reduction.

2. **Allowing OSFH Habitat Windows for Managed Stands at a Younger Age:** Considering the amount of time needed for this analysis and our position in the Management Plan process, no further analysis has been done. Analysis of this by DNR&E and a revision of the habitat windows may impact future AAC. On License 2, Gross OSFH Habitat directly limits AAC increases in 50 years.

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3. **More Liberal Interpretation of Opening Size and Adjacency Rules:** This could have some benefits in portions of License 2. Even if some sign of flexibility has been transmitted from DNR&E, the government felt the obstacles were too great to deviate from current rules.

The 7.1% reduction in Softwood AAC is explained by a more realistic Net-down factor, a landbase reduction, a more conservative commercial thinning approach and the implementation of Protected Areas.

We hope that you find this 2002 License 2 Management Plan to your satisfaction. UPM staff look forward to implementing this plan over the next five years.

With kind regards,

UPM-Kymmene Miramichi Inc.
Woodlands Department

Pierre Lebel, R.P.F.
Management Forester

SUBMISSION FORM

LICENSE #2

2002-2081 FOREST MANAGEMENT PLAN

The 2002-2081 Forest Management Plan is hereby submitted to the Department of Natural Resources and Energy.

I hereby certify that this report has been prepared under my personal supervision.

Prepared By: _____ **Date:** _____
Pierre Lebel, R.P.F.
Management Forester
UPM-Kymmene Miramichi Inc.

Submitted By: _____ **Date:** _____
Douglas Prebble
Woodlands Director
UPM-Kymmene Miramichi Inc.

Received By: _____ **Date:** _____
Wayne Clowater, R.P.F.
Regional Resource Manager
Dept. of Natural Resources & Energy

Approved By: _____ **Date:** _____
Wayne Clowater, R.P.F.
Regional Resource Manager
Dept. of Natural Resources & Energy

Letter of Plan Acceptance from Regional Resource Manager

EXECUTIVE SUMMARY

Following the requirements of the New-Brunswick Crown Lands and Forests Act, UPM-Kymmene Miramichi Inc. has prepared this Management Plan for Crown Timber License #2. The plan comes into effect on April 1st, 2002, and it forecasts timber and habitat supply for 80 years, while harvest blocks and specific habitat areas are mapped and forecasted for 30 years. The plan addresses objectives for a number of values as detailed in the document entitled "A Vision for New Brunswick Forests (Revised March 10th, 2000)". The resulting volumes from the timber supply analysis that are reported in this management plan are summarized in Table 1.

Table1. Summary of the 2002-2007 spatial harvest level from License 2

LANDBASE	PRIMARY VOLUME AND FALLOUT *					
	SPRUCE, FIR, & JACK PINE (M^3/YR)	HARDWOOD (M^3/YR)		CEDAR+ (M^3/YR)	PINE+ (M^3/YR)	TOTAL (M^3/YR)
		HWD.	POP.			
General Forest	256 614	89 386	26 545	7 963	5 215	**385 723**
Buffers^	200	70	20	0	0	**290**
DWA	13 500	10 389	1 296	723	457	**26 365**
OSFH^	200	70	20	0	0	**290**
Inoperable^	1 000	350	100	0	0	**1 450**
Total•	**271 514**	**100 265**	**27 981**	**8 686**	**5 672**	**414 118**

* The Spruce, Fir & Jack Pine, Hardwood and Poplar AAC has been reduced by 10% in order to take into consideration the new buffers created by the unmapped brooks as well as the unexpected wet and inoperable areas. Since the blocking was done manually, there is no additional "squaring-up" cost.

\+ A net down reduction of 10% was also applied to the Cedar and Pine. However, in order to compensate for the lack of quality product, an additional net down of 40% as been applied (Total net down = 50%).

^ Because of the small volume involved, that harvest level was not incorporated in the model.

• From this plan, an additional 1 879 m^3/yr. of OTSW (Eastern Hemlock and Tamarack Larch) is available from the General Forest. Another 18 m^3/yr. is also available from the DWA (10% net down included for both landbases).

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1.0 BACKGROUND

1.1 REQUIREMENTS OF THE CROWN LANDS AND FORESTS ACT

Management of the Crown Lands in New Brunswick is governed by the Crown Lands and Forests Act. The Act was adopted in 1980 and provides for the division of provincial Crown forest lands into 10 Timber Licenses. Each License has been allocated to one of the larger forest-based companies in the Province and each of the Licensees has to meet specific obligations under the Act.

The Act is administrated by the New Brunswick Department of Natural Resources and Energy (DNRE) and requires, among other things, that Licensees prepare Management Plans that describe how the License will be managed for both timber and non-timber resources. Sustainable supplies of timber are determined for an 80-year horizon and the source of sustainable supply is mapped for a minimum of 25 years. The first Management Plan was prepared in 1982 and as per the Act, was revised every 5 years ever since. From that Management Plan, an annual Operating Plan is developed and shows how the Management Plan will be implemented each year on the ground.

Each Management Plan is scrutinized by DNRE and approved by the Regional Resource Manager. In addition, every 5 years, coinciding with the revision of the Management Plan, Licensees are evaluated on the success of their management efforts as described in the Management Plan.

The Management Plan contained in this document has been prepared by UPM-Kymmene Miramichi Inc. and describes the management strategy for the Nepisiguit License # 2 for the next 80 years. This Management Plan is set to begin on April 1st, 2002 and

includes maps showing the source of the sustainable harvest and habitat areas for the next 30 years or six periods of five years.

1.2 SUMMARY OF THE 1997 MANAGEMENT PLAN

The previous Management Plan for License 2 was submitted in 1997 and incorporated many timber and non-timber objectives. One of the objectives was to include public input in the management planning process and on how Management Plan objectives would be met over time. Also part of the objective was to maintain the integrity of any existing recreational sites on the License.

In 1997, a new objective was put in place in order to respect the biodiversity on Crown Lands. To meet that objective, Licensees had to maintain a maximum fluctuation of 10% in the total area of Softwood, Softwood/Hardwood, Hardwood/Softwood and Hardwood cover types during the 80-year planning horizon. That objective was primarily put in place in order to maintain the diversity of the present forest covers.

Among the objectives in place, all sites with specific ecological, historical, cultural or scenic value had to be protected and preserved. For the 1997 plan, DNRE did not identify any type of Unique Sites on License #2.

In order to maintain the water quality, watercourse buffers had to be maintained along all watercourses with a discernable channel of 0.5 meters and wider. All the watercourse buffers were identified by the DNRE and depending upon the characteristics of the watercourse, the provincial average range was 25 to 150 meters on each side of the water.

The Wildlife Habitat objectives included Deer Critical Wintering Habitat (DCWH) and Mature Coniferous Forest Habitat (MCFH). On License #2, a total of 22 571 ha was set aside in order to manage DCWH.

It was determined by DNRE, that twenty-five bird and four mammal species depend on or strongly prefer mature and overmature conifer forest to provide their habitat structure. To ensure this forest structure exists, ten percent of the conifer-dominated forest on each License was maintained in a mature coniferous forest habitat (MCFH). To do so, a total area of 19 991 ha was set aside for MCFH on License 2. After meeting all of those objectives, the softwood and hardwood AAC, summarized in Table 1.1, were maximized over the planning horizon.

Table 1.1 Summary of the 1997-2002 spatial harvest level for License 2

LANDBASE	PRIMARY VOLUME AND FALLOUT *				
	SPRUCE, FIR, & JACK PINE (M^3/YR)	HARDWOOD HWD. + POP. (M^3/YR)	CEDAR+ (M^3/YR)	PINE+ (M^3/YR)	TOTAL (M^3/YR)
General Forest	279 650	98 780	11 861	6 212	**396 503**
Buffers	0	0	0	0	**0**
DWA	10 793	13 293	368	380	**24 834**
OSFH	0	0	0	0	**0**
Inoperable	0	0	0	0	**0**
Total*	**290 443**	**112 073**	**12 229**	**6 592**	**421 337**

* The Spruce, Fir & Jack Pine AAC was reduced by 6% in order to take into consideration the buffers created by the unmapped brooks as well as the unexpected wet and inoperable areas.

\+ In order to compensate for the lack of quality product as well as wet and inoperable ground, the Cedar and Pine AAC was reduced by 50%.

1.3 MANAGEMENT PLANNING OBJECTIVES FOR 2002

The Minister of Natural Resources and Energy is responsible for the development, utilization, protection and integrated management of the resources on Crown lands (Crown Lands and Forest Act). The mission of the DNRE is to manage the natural resources of the Province in the best interest of its citizens. This requires the establishment of goals and objectives to be met over time.

The challenge is to define the best balance of management objectives that will benefit all New Brunswickers. To do so requires an understanding of the positive and negative impacts associated with the setting of objective levels. It is also important to recognize the needs of change over time. Consequently, in New Brunswick, Crown land objectives are reviewed every five years to ensure that they reflect the changing needs of society. Government is responsible for establishing goals, objectives and standards. To achieve them, Crown Licensees are responsible for developing management and operating plans.

The 2002 goals and objectives for Crown Land management are described in the document entitled "A Vision for New Brunswick Forest" (Appendix II). This public document is available through the DNRE. The document can also be found on the DNRE World Wide Web site at the following address: http://www.gov.nb.ca/0078/vision.htm.

The document describes a range of objectives for Crown Land management including those of biological, environmental, social and economic importance. It is linked to Canada's Forest Accord (http://www.nrcan.gc.ca/cfs/nfs/strateg/acontrol_e.html), a national document that describes objectives for maintaining the sustainability of Canada's forests.

The Vision document was prepared by the DNRE and was produced in order to set forth the philosophy, principles, and direction to be followed in the management of Crown forests in New Brunswick. Therefore, it is intended to provide direction for Crown Timber Licensees in preparation of their Management Plans.

From "A Vision for New Brunswick Forests" there are a number of specific objectives with operational requirements that must be addressed in the 2002 plan. These are covered in the following sections.

1.3.1 Public Input

Licensees are required to solicit public views on how Management Plan objectives will be met. The main objective behind public input is to inform the public about the management planning effort on Crown Lands.

1.3.2 Forest Ecosystems

Healthy forest ecosystems are required to maintain our quality of life. To achieve this it must be ensured that any human intervention or management activities will not alter the sustainability of the essential ecological processes, the biological diversity of the landscape, the productivity, the resilience, and the capacity of renewal of our forest. For these reasons, the 2002 forest management objectives have been strengthened to include maintenance of the diversity of forest ecosystems and their associated ecological values.

1.3.2.1 Vegetation Communities

In the 2002 Forest Management Plan, Forest ecosystems are represented by aggregations of forest stands. The ecological descriptors of aggregated stands are the Vegetative Communities. In the Vision Document, nine vegetation communities have been identified and are named as follows: Tolerant Hardwood Pure (THP), Tolerant Hardwood – Softwood (THSW), Intolerant Hardwood – Softwood (IHSW), Pine (PI), Jack Pine (JP), Cedar (CE), Black Spruce (BS), Spruce (SP), and Balsam Fir (BF). These Vegetation Communities were defined using the overstory tree species composition. Their older successional stages are those which are targeted for objectives.

The Vegetation Communities are expressed as area (ha) in the OLD and/or LARGE stage of each community across Crown Land. These targeted areas, in the OLD and/or LARGE stage, are equivalent to 12% of the total area in each community as defined in the 1982 provincial inventory and adjusted for human disturbance. It was determined that in order to maintain a balanced and sustainable ecosystem each Vegetative Community must have 12% of their area in old or large state. Objectives were determined for every Eco-region in the province and prorated to Crown Licenses.

1.3.2.2 Unique Sites

Forest ecosystems are further protected using a fine-filter approach of preserving sites of high or unique ecological, historical, cultural or scenic value. This objective is further enhanced through the Protected Areas Strategy (PAS) developed by the government of New Brunswick.

1.3.3 Wildlife Habitat

1.3.3.1 Old Habitat Types

All forest-dwelling vertebrate wildlife species (birds, mammals, reptiles, amphibians) have been characterized with respect to habitat associations that occur at the scale of forest lands. Six distinct upland habitat types were described as a result of that process: Old Tolerant Hardwood (OTHH), Old Hardwood (OHWH), Old-Spruce-Fir Habitat (OSFH), Old Pine (OPIH), Old Mixedwood (OMWH), and Large Mixedwood (LMWH). The habitat objectives were calculated based on maintaining viable populations of all indigenous species. Objectives for each habitat type were calculated for each Eco-region of the province and were then prorated for every License. As for the Vegetation Communities, the Old Habitat objective, represented in hectares of each of these habitat types, must be maintained over 16 periods or the 80-year planning horizon.

1.3.3.2 Deer Wintering Areas (DWA)

Winter is a critical season for deer populations in New Brunswick, therefore, habitat must be maintained for their protection. Deer experience conditions of cold and snow that fluctuate between moderate and severe. For this reason, two habitat types have been identified as important to winter survival of Deer: Moderate Winter Deer Habitat (MWDH) and Severe Winter Deer Habitat (SWDH).

MWDH is provided by stands with high food value and at least some cover for thermal shelter. Deer access MWDH when snow and temperature conditions do not restrict mobility. SWDH is provided by stands with high snow and thermal cover value and at least some

browse availability. Deer use SWDH when deep snow or very cold temperatures limit access to other stand types.

Habitat management is planned and implemented on the deer wintering area landbase defined for each License. On all Crown Land Licenses, the primary management objective in DWA is to maximize the long-term sustainable supply of SWDH and secondly the MWDH.

Management plans are required for individual DWA before timber harvest operations can take place. The 2002 Management Plan provides a strategic overview of deer winter habitat supply, management activities, and expected wood supply from DWA for the next 80-years.

1.3.4 Timber

New Brunswick is very dependent on its forest industry to sustain economic benefits. To satisfy this requirement, timber supply must be sustainable and maximized after meeting all of the other non-timber objectives. In order to do this, given the current age class structure of the Crown forest, it is necessary to harvest the oldest and declining forest stands first to capture as much natural mortality as possible. To do so, a range of harvest prescriptions must be investigated.

It is also prescribed that clearcut harvest blocks will not exceed 100 ha in size. The timing of harvest in adjacent blocks must not be less than 2 periods (period = 5 years) when the combined area of adjacent blocks exceeds 100 ha. Larger harvest blocks are possible if their purpose is to salvage mortality resulting from blowdown, fire, disease, etc., but this requires special DNRE approval.

Silviculture treatments of planting and spacing will be implemented to support the sustainable wood supplies and other non-timber objectives.

1.3.5 Water

1.3.5.1 Watercourse Buffers

Per definition, a watercourse is any natural water drainage channel. Watercourse buffer zones are observed to protect water quality and aquatic habitat. As part of this plan, watercourse buffer zones will be maintained along all watercourses with a discernible channel of 0.5 meters or wider.

1.3.6 Recreation & Aesthetics

1.3.6.1 Recreation

As required by the Vision document, the integrity of any existing recreational sites on License 2 will be maintained. A map showing the location of those sites as well as a list can be found in Appendix III.

One of the main objectives behind the establishment of those sites is to favour canoeing as well as other activities on the Nepisiguit River. Most of the sites were established during the summer of 1996 and the work was focused on the landings from McEwen Bridge to TV Tower landing. Signs indicating the landing sites were installed at the main road, at the sites themselves and 100 m before the sites on the river. Metal fire pits and cedar benches were also installed in many places. Other recreational sites also include hiking and portaging trails

as well as known resting and camping sites. Technical and Staff support have also been made available in order to help the First Nation in the MI'GMAG trail construction.

1.3.6.2 Aesthetic Buffers

Aesthetic buffer zones of 30 meters wide will be maintained along all provincial highways that abut Crown Forest Lands.

1.4 PUBLIC INPUT

To fulfil the public input objective, the Licensee decided to form a Forest Management Consultation Committee. The group was composed of several local user groups and association representatives. The main objective behind the process was to solicit public views on the forest management efforts that are being made on N.B. Crown Lands. The role of each member was to take the information they received from these sessions and relay it to the members of their organization. Feedback, comments and concerns regarding the forest management efforts were welcomed from any participants and members of their organization.

The purpose of the group was not to form a working group for the preparation of the Management Plan. The purpose was to create a network of informed people on the policies and objectives used for Crown Land Management, as well as, the procedures and tools used in the planning process to achieve sustainable management. A series of information sessions were prepared and presented to the committee to achieve this goal. Minutes of all the meetings are documented in Appendix IV.

The discussed topics were:

- History and Description of Crown Land and Forests Act
- Objectives and Goals for Crown Land Management (Vision document)
- Forest Management planning process
- Operational Planning process
- Habitat Management on Crown Land
- Status of the 2002 FMP and the Watershed Designation Order

Over the past five years, other efforts have been put forth to inform and gather feedback from the public. The efforts put in place were; teacher tours, student visits as well as presentations to College and University students. A teacher tour was organized annually in order to promote management planning as well as harvesting and silvicultural operations on the license. These tours were full day events and the goal was to inform the educators about the forest industry so that they may use the information with their students. The University of Moncton and the Bathurst Ranger School were visited a number of times, and presentations were given to the forestry students regarding forest management planning and habitat management. The License has hosted forestry field courses or sessions for the University and Ranger School where the students were taken on tours and were exposed to the management of the License as well as the types of operations that are implemented. Tours of the forestry office were also provided with an introduction to our Geographical Information Systems (GIS) and other computer systems. Descriptions of these and other efforts are presented in Appendix V.

1.5 MANAGEMENT PLANNING PROCEDURES

Incorporating multiple objectives in land management is a challenging process. It requires manipulation of a forest inventory, growing it into the future, while at the same time balancing tradeoffs between objectives. It is a process that is difficult, if not impossible to handle manually. Consequently computer-based models have been developed to manipulate data and provide information for decision making. In New Brunswick, the WOODSTOCK wood supply model serves this function. It is an optimization model that functions as an accounting tool, keeping track of forest growth (interest) and tracking harvest volume (withdrawals) while at the same time reporting the suitability of the harvest for certain types of wildlife and other objectives. The model uses forest inventory data that describe individual stands on the License. Stands with similar growth and development patterns are grouped into strata or classes. Each stratum, after harvesting or silvicultural treatment, is described by a transition matrix. Each of these components is discussed in the following sections. Furthermore, all digital files used during this management plan process can be found in Appendix VI. More details on those files can be found in Appendix VII.

2.0 PRESENT LAND BASE DESCRIPTION

2.1 FOREST INVENTORY

This management plan is based on a forest inventory that was developed in 1984 (9%), 1985 (11%), 1995 (52%) and 1997 (28%) by interpreting color aerial photos at a scale of 1:12 500. The interpretation involved delineation of forest stands and assigning attributes to those stands that described their species composition, maturity and crown closure. A network of temporary sample plots on the License supported these interpreted attributes. The plots supplied additional attributes such as volume, age, height and improved the statistical reliability of the inventory.

The inventory is maintained on a Geographic Information System (GIS) and is continuously updated with harvesting and silviculture activities as they take place. Because this Management Plan has to be prepared prior to its starting date of April 1, 2002, the inventory used for this Management Plan is current up to March 31st, 1998 for harvesting and March 31st, 1999 for silviculture. In order to mimic the activities that took and that will take place between 1998-99 and 2002, the following information was also used:

- Actual harvesting and silviculture operation blocks from Annual Reports that have taken place since the last inventory, but have yet been updated in the GIS inventory;
- Proposed harvest and silviculture activities in the most recent Operating Plans until March 31st, 2002.

2.1.1 Area Description

The Nepisiguit License 2 has a total area of 259 369 ha and is located in North Eastern New Brunswick, mainly west of Bathurst (Figure 2.1). Of the total License area, 93% or 240 603 ha is comprised of timber productive forest (Figure 2.2), while the other 7% or 18 766 ha consists of non-timber productive forest, wetlands and roads (Table 2.1).

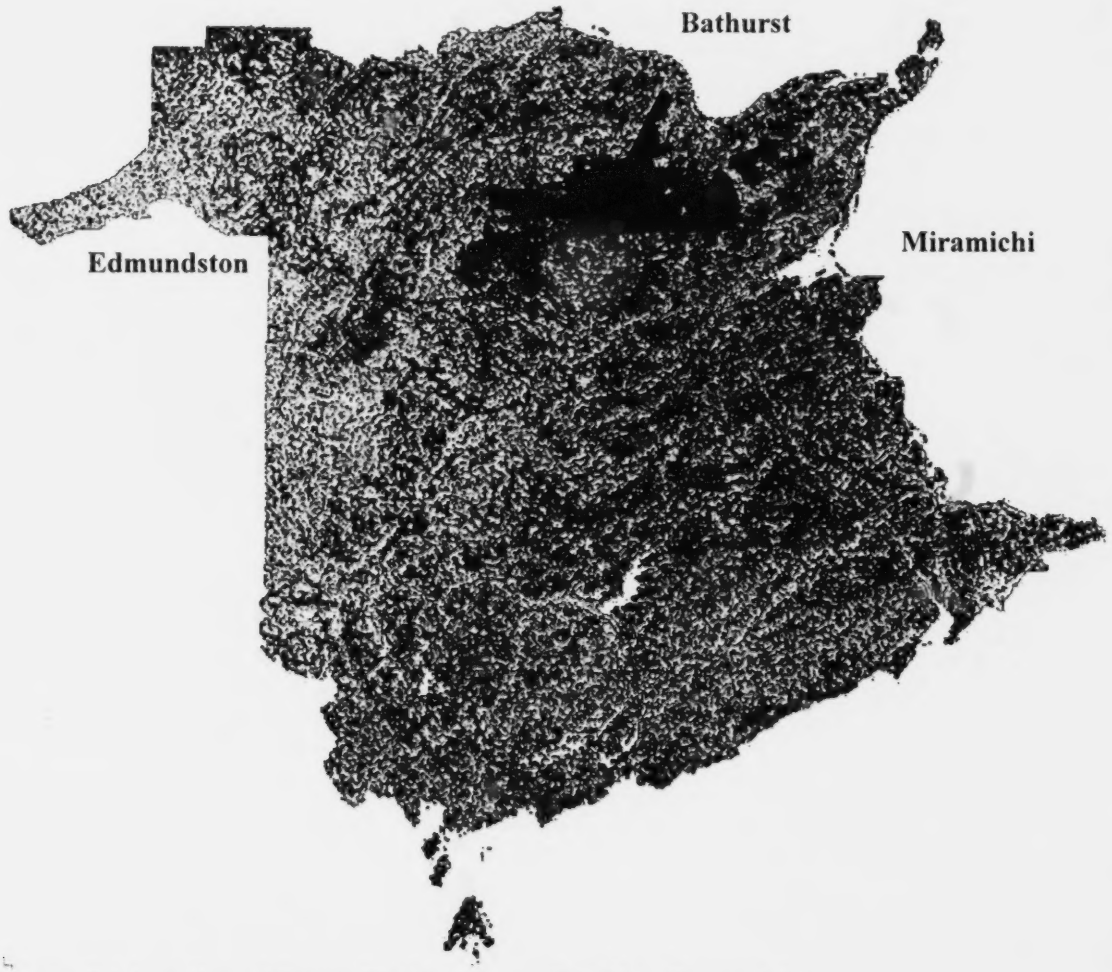

Figure 2.1 Location of Crown Timber License 2 in New Brunswick.

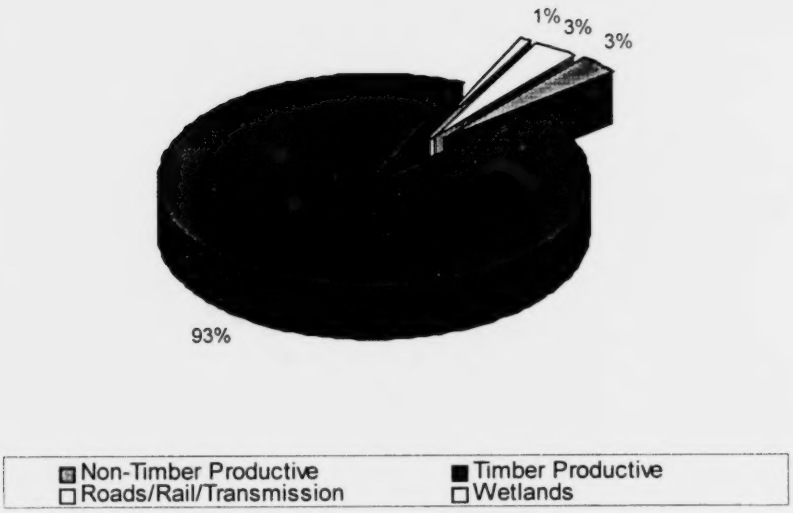

Figure 2.2 Summary of total area by land classification for License 2.

Table 2.1 Summary of total area by land classification for License 2.

Landbase	Area (ha)
Timber Productive	240 603
Non-Timber Productive	8 269
Roads/Rails/Transmission	1 895
Wetlands	8 602
Total	259 369

Since the 1997 Management Plan, a protected area strategy (PAS) has been put in place. Two such protected areas have been set aside on the Nepisguit License #2 and are located in the Mt. Carleton and Jacquet River area. The names of these two protected areas are Upper Nepisiguit River Protected Area and the Jacquet River Gorge. The two areas combined make up a total of 13 062 ha or 5% of the total landbase area.

Individually, the Upper Nepisiguit River Protected Area represents 6 631 ha of License 2 while the Jacquet River Gorge PAS represents 6 431 ha of License 2 (Table 2.2). No forestry

operations in the Upper Nepisiguit River Protected Area will be allowed. However, some harvesting will be permitted in a designated portion (5 056 ha) of the Jacquet River Gorge over the next 10 years (until 2012). Afterwards, no harvesting will be permitted in any Protected Areas. Although no harvesting will be permitted, the protected areas do contribute to the non-timber objective requirements.

Table 2.2 Protected Areas Strategy (PAS) summary for License 2.

Protected Area Name	Timber Productive Forest	Total Forest (Timber Productive and Non-Timber Productive)
Jacquet River Gorge (Open for some harvesting)	4 738	5 056
Jacquet River Gorge (non-harvestable)	1 167	1 375
Upper Nepisiguit River	6 538	6 631
Total	**12 443**	**13 062**

In order to determined how much harvesting could occur in the harvestable area of the Jacquet River Protected Area, it was agreed by the government to use the total area of period 2 and 3 blocks from the 1997 Management Plan. The maximum area was then set to 1 469 ha. In this Management Plan, a total of 1 160 ha have been blocked for harvesting.

As noted in Section 1.3, the 2002 Management Plan embodies specific land management objectives. As illustrated in Figure 2.3, some of these objectives are applied to specific areas within the productive forest and include areas for the management of Old Spruce-Fir Habitat, Deer Wintering Habitat (DWA), water quality and timber.

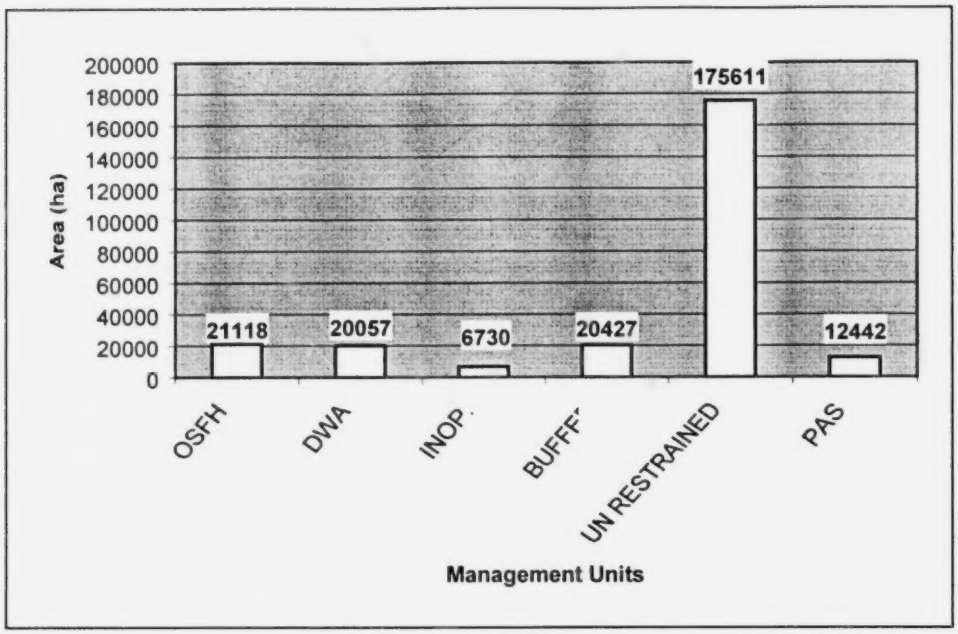

Figure 2.3 Summary of timber productive forest area by primary objective for License 2.

The distribution of the management units as prescribed in Figure 2.3 is not always as clearly separated. In fact, most of the units overlap each other at some point. For example, a specific area can be part of a DWA and an OSFH block at the same time. In order to clearly establish this distribution, Table 2.3 shows the area of timber productive forest for each individual management unit for License 2.

Table 2.3 Area summary of productive forest for each management unit on License 2.

Management Units	Area (ha)	Management Units	Area (ha)	Management Units	Area (ha)
Unrestrained	175 611	**DWA/Buffer/PAS**	227	**OSFH/Inop/Buffer**	45
PAS	7 015	**DWA/Inop**	352	**OSFH/Inop/Buffer/PAS**	45
Buffer	13 064	**DWA/Inop/Buffer**	326	**OSFH/DWA**	1 088
Buffer/PAS	856	**DWA/Inop/Buffer/PAS**	4	**OSFH/DWA/PAS**	295
Inop	3 540	**OSFH**	14 506	**OSFH/DWA/Buffer**	219
Inop/PAS	483	**OSFH/PAS**	2 271	**OSFH/DWA/Buff/PAS**	144
Inop/Buffer	748	**OSFH/Buffer**	1 215	**OSFH/DWA/Inop**	84
Inop/Buffer/ PAS	27	**OSFH/Buffer/PAS**	130	**OSFH/DWA/Inop/PAS**	56
DWA	13 566	**OSFH/Inop**	433	**OSFH/DWA/Inop/Buff.**	17
DWA/PAS	318	**OSFH/Inop/PAS**	557	**OSFH/DWA/Inop/Buff/ PAS**	14
DWA/Buffer	3 347	**TOTAL AREA = 240 603 ha**			

2.1.2 Age Class Distribution

The License 2 forest is currently composed of 64% softwood, 14% hardwood, 12% mixedwood and 10% of non-commercial covertypes (Figure 2.4). The age class distribution for the softwood forest is predominantly in the mature stage with area represented in the young to immature classes of development as well (Figure 2.5). The age class distributions for the hardwood and the mixedwood lay predominantly in the younger age classes (Figure 2.6 and 2.7).

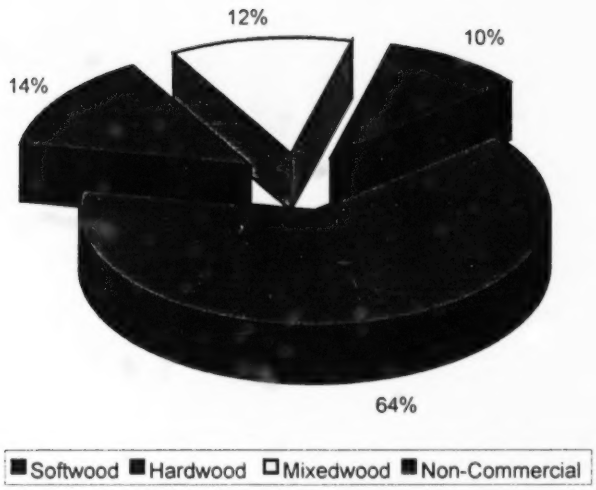

Figure 2.4 Summary of timber productive forest area by covertype for License 2.

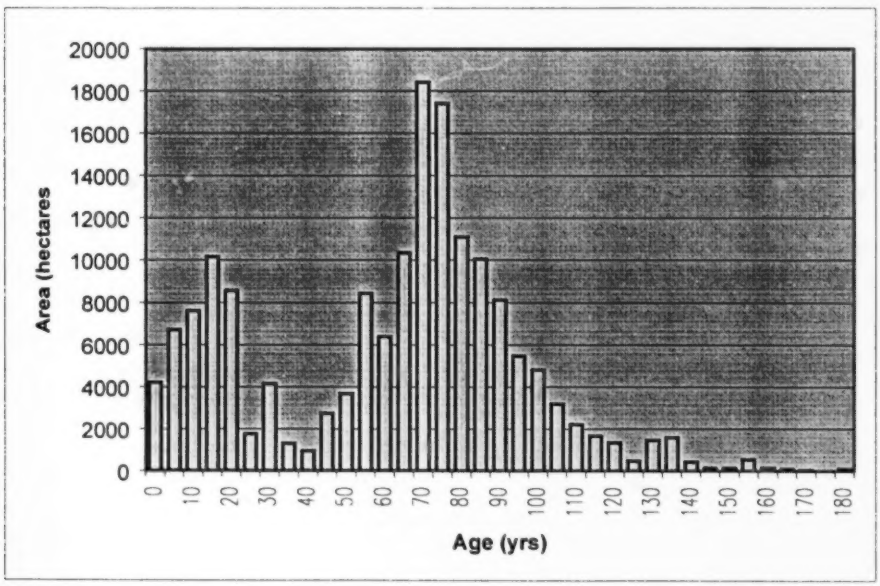

Figure 2.5 Age class distribution for License 2 softwood covertypes.

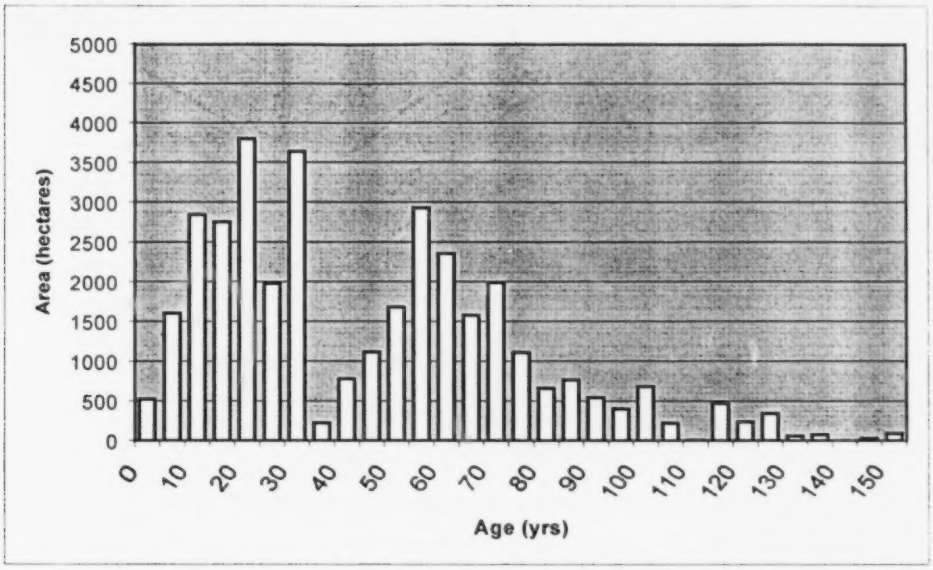

Figure 2.6 Age class distribution for License 2 hardwood covertypes.

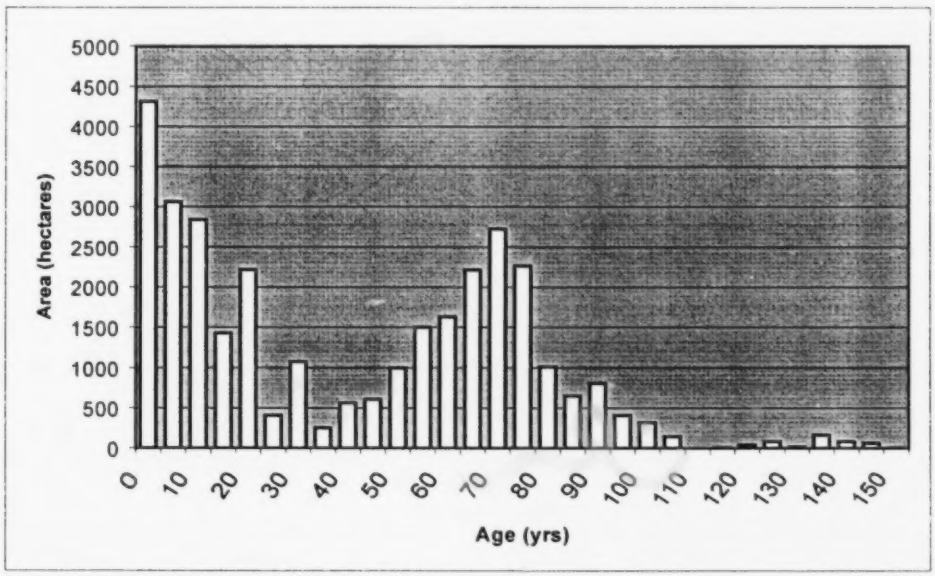

Figure 2.7 Age class distribution for License 2 mixedwood covertypes.

2.2 FOREST STRATIFICATION

The wood supply model used for the construction of the 2002 Forest Management Plan requires that forest stands on the License be grouped into strata or classes having similar development patterns. This requires detailed examination of the inventory for the entire productive forest using all available Forest Development Survey (FDS) data to decide which stands should be "lumped" together and which should be "split" apart. It is an iterative process that requires the use of computer programs as discussed in the up-coming sections.

For the 2002 Forest Management Plan, DNRE decided to set a minimum stratification standard in order to meet their management objectives. It was suggested to base the stratification upon an Ecological Land Classification system (Eco-region, Eco-district and Vegetative Community or Forest Community types).

On License 2, various inventory variables were analyzed for forest stratification. As prescribed by DNRE, the forest community type and the Eco-regions were used as the base variables. From there, other types of variables such as Eco-district, L1Funa, FST, L1VS and Crown Closure were analyzed and used where applicable. A combination of variables resulted in the final forest stratification described in appendix VIII. The file "Yield Curve Info.xls" can also be found on the enclosed CD-ROM in appendix VI.

2.3 YIELD CURVES

The strata described above require yield curves that report the volume, wildlife habitat as well as Vegetative Community development through time. For this planning exercise, yield curve construction was a result of combined efforts between licensees and the N.B Growth

and Yield Unit. The unit was mainly established in order to create a growth and yield development program that would be used along with the FDS database. Every Licensee used the program in order to create the final set of yield curves stored in appendix VI.

2.4 DESCRIPTION OF HARVEST AND SILVICULTURE TREATMENTS

Listed in Table 2.4 are all of the harvesting and silviculture treatments that were modeled in the Spatial Management Plan proposal. The Table summarizes all of the treatment codes used in the WOODSTOCK action file, the treatment name, the treatment description as well as the stand type eligibility.

2.4.1 Clearcut

The Clearcut treatment, as described in Table 2.4, will remove all merchantable stems from the treated area and will normally take place in forest stands that are experiencing rapid volume loss. However, the treatment may also be applied in stands that are stable or mature.

2.4.2 Commercial Thinning

The Commercial Thinning treatment, as described in Table 2.4, will occur between 30 and 45 years of age and will remove from 25% to 30% of the standing volume. In post 1985 full plantations, two passes of commercial thinning followed by a clearcut will be applied. About 30% of the original volume will be removed during the first intervention at age 30 while another 25% will be removed at age 45. The remaining volume will be clearcut 10 years later at age 55.

Table 2.4. Harvest and silviculture treatments proposed for License 2.

Treatment Code*	Treatment Name	Treatment Description	Stand Type Eligibility
CC	Clearcut	Remove all merchantable stems of all species	• All stand types within General Forest and/or OSFH except commercially thinned stands.
CCPAS	Clearcut	Remove all merchantable stems of all species	• All stand types within the Jacquet River Gorge Protected Area (Harvestable zone for the next 10 years.)
CCCT	Clearcut	Remove all merchantable stems of all species	• All stands that originate from a Commercial Thinning in the General or OSFH Forest. Minimum of 10 years after Com. Thinning.
CCDWA	Clearcut	Remove all merchantable stems of all species	• All stand types within the managed DWA, including commercially thinned stands
CT	Commercial Thinning	**First Pass:** Remove 30% of the standing volume of all Merchantable stems. The pre 1985 plantations will be treated between the ages of 40-45 and post 85 will be treated between ages of 30-35. All Swd. PCT stands will be treated between the ages of 40-45.	• All plantations and softwood pre-commercial thinning in the General or OSFH Forest
CTX	Commercial Thinning	**Second Pass:** Remove 25% of the standing volume of all Merchantable stems. The pre 1985 plantations will not be treated. The post 85 will be treated between ages of 45-50. All Swd. PCT stands will not be treated.	• Only the post 1985 plantations in the general or OSFH Forest will be treated with a second pass.
CTDWA	Commercial Thinning	Remove 30% of the standing volume of all Merchantable stems. The pre 1985 plantations will be treated between the ages of 40-45 and post 85 will be treated between ages of 30-35. All Swd. PCT stands will be treated between the ages of 40-45.	• All plantations and softwood pre-commercial thinning in the managed DWA.
STRIP	Strip Cut	**First Pass:** 33% removal of all standing volume in a strip cut pattern at age 110 years.	• Selected cedar stands >= 5 ha with EC>=50% (curve names were changed from EC to SEC. • In General Forest only.
STRIPX	Strip Cut	**Second Pass:** 33% removal of original standing volume 10 years following the 1st strip cut removal. **Third and Final Pass:** Removal of the remaining volume 10 years following 2nd.	• Selected cedar stands >= 5 ha with EC>=50%. • In General Forest only.
SHELTER	Pine Shelterwood	**First Pass:** remove 30% of the standing volume in a shelterwood pattern.	• All Forcom PI>=5 ha with at least 50% of RP, WP, or PI. • In General Forest only. • Curves names were changed from PI to SPI.
SHELTERX	Pine Shelterwood	**Second Pass:** remove 30% of the original standing volume 20 years following 1st pass. **Final Pass:** Remove the remaining of the original volume 20 years following 2nd pass.	• All Forcom PI>=5 ha with at least 50% of RP, WP, or PI. • In General Forest only.
THSEL	Tolerant hardwood selection cut	**First Pass:** On average 22% of the standing volume is removed. Most of the SWD species are targeted during the first pass.	• Selected PT or TH stands >= 5 ha • Curves names were changed from PT to SPT, etc... • In General Forest only.
THSELX	Tolerant hardwood selection cut	**2nd pass and up:** On average 22% of the standing volume is removed every 20 years.	• Selected PT or TH stands >= 5 ha • Curves names were changed from PTx to SPTx, etc...

Treatment Code*	Treatment Name	Treatment Description	Stand Type Eligibility
			• In General Forest only.
PATCH	Patch Cut	**First Pass:** 33% removal of all standing volume in a patch cut pattern. These patches are small openings 0.03ha-0.13 ha in size. **Second Pass:** 5 years following 1st pass, 33% of the original standing volume will be removed in a patch cut pattern. **Third and Final Pass:** Remove remaining merchantable volume of all species 5 years following 2nd patch cut.	• All stands having a BF, SP, or BS Veg. Com curve. • In managed DWA only.
FULL_PLANT	Full Plantation	Softwood restocking of forest land	All non-stocked stands (<45%)
FILL_PLANT	Fill Plantations	Softwood stocking improvement of forest land	All low stocked stands (>=45% and < 75%)
PCTHIN	Pre-Commercial Thinnning	Reduces stand density to 2000-2500 stems per hectare at 10-20 years old.	Most softwood, mixed wood and hardwood stands.

* **Note: Coding corresponds with actions in Woodstock Action file.**

In pre 1985 full plantations as well as in softwood pre-commercially thinned stands, one commercial thinning pass will remove 30% of the volume at age 40. The remaining volume will be clearcut 15 years later at age 55.

2.4.3 Strip Cut

The strip cut treatment will be applied when the cedar is 110 years of age. During the first intervention, 33% of the stand will be removed in strips of 10 meters apart. Another intervention will be conducted 10 years after the initial harvest in order to remove another 33% (1/3) of the original standing volume. The final harvest will occur 10 years after where the remaining 33% of the stand will be removed.

2.4.4 Tolerant Hardwood Selection Cut

In order to promote tolerant hardwood regeneration and to favor the production of tolerant hardwood saw logs in the tolerant hardwood and tolerant hardwood-softwood stands,

a selection cut treatment was developed. On average, about 22% of the standing volume will be harvested every 20 years. Furthermore, the first few passes will remove most of the softwood and poor quality trees in the stands.

2.4.5 Pine Shelterwood Cut

A shelterwood harvest will be done when the candidate pine stands are at least 100 years of age. During the first intervention, 33% of the stand will be removed using a shelterwood method. The treatment will create openings on the forest floor to promote pine regeneration. The residuals will provide a seed source for the establishment of the future stand. A second intervention will be conducted 20 years after the initial harvest to remove another 33% (1/3) of the original standing volume. The final harvest will occur at about 140 years of age and the remaining original volume of the stand will be removed. At that time, a young under story should be well established.

2.4.6 Full planting

Full planting will be used in order to ensure non-stocked harvested areas are adequately restocked through natural regeneration or planting of softwood species.

2.4.7 Fill planting

The fill planting method will supplement existing acceptable softwood regeneration in order to raise the stocking level of planted plus natural seedling to a certain minimum.

2.4.8 Softwood, Mixedwood and Hardwood Pre-Commercial Thinning

The Pre-Commercial thinning treatment will normally be done in all stands growing on good sites and meeting all of the DNRE criteria at age 15. The treatment will remove undesirable trees in order to free the best crop trees from competition. This will reduce the number of individuals in the stand, accelerate the crop trees growth and improve the overall quality of the stand.

2.5 POST TREATMENT REGENERATION RESPONSE

As forest stands are harvested, it is necessary to predict the new stand type that will become established. This is done in the WOODSTOCK model through the transition matrix that describes post treatment regeneration response.

Data collected between 1989 and 1995 from 5th year survey plots were used to predict cutover response (transition) for License 2. The matrix was created by stratifying 5th year survey plots by pre-harvest Vegetation Communities and Eco-districts. While using the pre-harvest stratification, the post-cut data was stratified by post-harvest Vegetative Communities as well as softwood and hardwood stocking.

As shown in Table 2.5, the result was a set of 10 pre-harvest communities (BSAL, SP02, SP03, etc...), each indicating the area percentage that will regenerate to each of the regenerating curves and stocking classes identified. Separate yield curves were developed for each of the cells where a regeneration response was indicated. Further information on the transition matrix can be found in appendix IX and X.

Table 2.5 Clearcut transition matrix for License 2.

PRE	POST-TREATMENT													
	RBF1	RBF2	RBF3	RBS1	REC3	RHW3	RHW4	RMX4	RPF1	RPF2	RPF3	RNR1	RNR2	PLN
BS	8	9	8	22	0	1	3	0	5	3	0	10	5	26
SP2	14	11	6	2	0	3	3	0	3	11	5	10	1	31
SP8	13	15	9	2	0	4	15	0	0	0	0	15	5	22
SP9	21	13	6	1	1	10	4	0	4	4	5	8	1	22
SW2	11	8	7	0	0	12	6	0	5	11	8	9	1	22
SW8	6	8	14	0	0	14	10	2	2	1	5	9	3	26
SW9	11	11	10	0	2	10	6	1	10	2	13	2	0	22
TH2	0	4	4	4	0	9	26	0	4	0	4	22	2	21
TH8	0	2	3	0	2	10	19	17	3	3	3	8	5	25
TH9	5	9	9	0	0	5	14	3	2	2	5	3	3	40

3.0 GENERAL FOREST

3.1 OBJECTIVES

The General Forest (175 611 ha) is a portion of the productive forest on License 2 that is not subject to spatial objectives such as Old Spruce Fir Habitat blocks, Deer Wintering Areas, buffers zones inoperable areas or protected areas. Nevertheless, the General Forest is expected to provide habitat for all types of species and it is used to meet the objective levels as specified in the Vision document.

The timber management objective for the general forest is to determine the maximum non-declining or sustainable harvest level that can be maintained over an 80-year planning horizon. This Annual Allowable Cut (AAC) will be achieved by harvesting the fastest volume declining stands first, while factoring in appropriate silviculture levels of planting and pre-commercial thinning. The harvesting level, as well as the amount of silviculture utilized can only be put in place if all of the other non-timber objectives are fulfilled.

3.2 SILVICULTURE IMPACTS ON ANNUAL ALLOWABLE CUT (AAC)

Silviculture (planting and pre-commercial thinning) has a positive impact on the sustainable harvest levels. In order to determine that impact, a non-spatial analysis was done to calculate the AAC without doing any silviculture. If planting and pre-commercial thinning would not be conducted on License 2, it was determined that the Spruce, Fir and Jack Pine sustainable harvest AAC would be 36% lower than what it is in this plan. The hardwood and Poplar AAC would also respectively be 2% and 48% lower. Furthermore, by not doing any

silviculture, it would not be possible to meet the Vegetative Communities and Habitat objectives as prescribed by the Vision Document.

3.3 SUSTAINABLE HARVEST LEVELS

Based on the final blocking and the silviculture levels proposed in this plan, License 2 is able to sustain a Spruce, Fir and Jack Pine harvest level of 256 614 m^3/yr for the entire 80-year planning horizon. License 2 is also able to sustain a Hardwood (without Poplar) harvest level of 89 386 m^3/yr and a Poplar harvest level of 26 545 m^3/yr. As specified in the footnote of Table 1, the final harvest levels were determined to be higher. However, the levels were reduced by 10% in order to take into consideration any new buffers created by unmapped brooks as well as unexpected wet and inoperable areas.

3.4 SUMMARY OF HARVEST TREATMENTS

Within the management planning process, it is required to group forest stands into operational harvest blocks. It is also required to map them for at least 25 years or through the low point in the growing stock (Figure 3.1 and 3.2).

The design of harvest blocks on the License also requires that they meet all the objectives as stated in the "Vision Document". As a result, openings created by harvest blocks cannot exceed 100 ha in size and there must be a 2-period delay between adjacent openings. The 2-period delay relates to an expected height growth of 2 meters which is used to reflect a structural difference between adjacent clearcuts that is significant to most wildlife. On License 2 the maximum opening size was never exceeded and the average opening size is

33 ha with a standard deviation of 25 ha. (Appendix XI). Table 3.1 is showing the amount of hectares per year and per period blocked for every harvest treatments in the General Forest.

Table 3.1 Summary of area harvested by treatment over the next 30 years on License 2.

Period	Harvest Area (Hectares / Year)									
	Clear Cut	Com. Thin.	Strip Cut			Shelterwood		TH Selection Cut		
			1	2	3	1	2	1	2	3
1	3211	34	21	0	0	4	0	36	9	0
2	2948	97	53	0	0	0	0	33	10	0
3	3117	219	20	14	0	9	0	50	22	0
4	2742	1401	42	35	0	1	0	43	0	0
5	2355	1970	16	13	7	0	4	64	36	9
6	2916	349	5	28	18	9	0	46	33	10
Avg.	2882	678	26	15	4	4	1	45	18	3

3.5 SUMMARY OF SILVICULTURE TREATMENTS

In order to meet all the long-term management plan objectives and to sustain the harvest levels described in section 3.3 a silviculture program will be put in place. Table 3.2 shows the prescribed levels of Full and Fill planting as well as Softwood, Mixedwood and Hardwood pre-commercial thinning for period 1 to 6.

Table 3.2 Summary of the silviculture area over the next 30 years.

Period	Silviculture Area (Hectares / Year)							
	Full Plant	Fill Plant	Total Plant	Pre-Commercial Thinning				Grand Total
				SWD	MWD	HWD	Total	
1	650	100	750	367	632	298	1297	2047
2	650	100	750	370	717	210	1297	2047
3	700	163	863	338	970	187	1496	2359
4	662	110	772	612	696	192	1500	2272
5	500	95	595	717	718	165	1600	2195
6	563	80	643	702	720	177	1600	2243
Avg.	621	108	729	518	742	205	1465	2194

3.6 OPERABLE GROWING STOCK

The total operable forest inventory available on the License at any given time is known as the growing stock.

3.6.1 Softwood Growing Stock

Figure 3.1 shows the level of softwood growing stock over the next 80-year planning horizon along with the sustainable harvest level. The shape of the growing stock has a typical profile for New Brunswick forest, whereby, the inventory steadily declines to a low point in period 6 and then rebounds. It is this low point that creates an impact on the current sustainable harvest level.

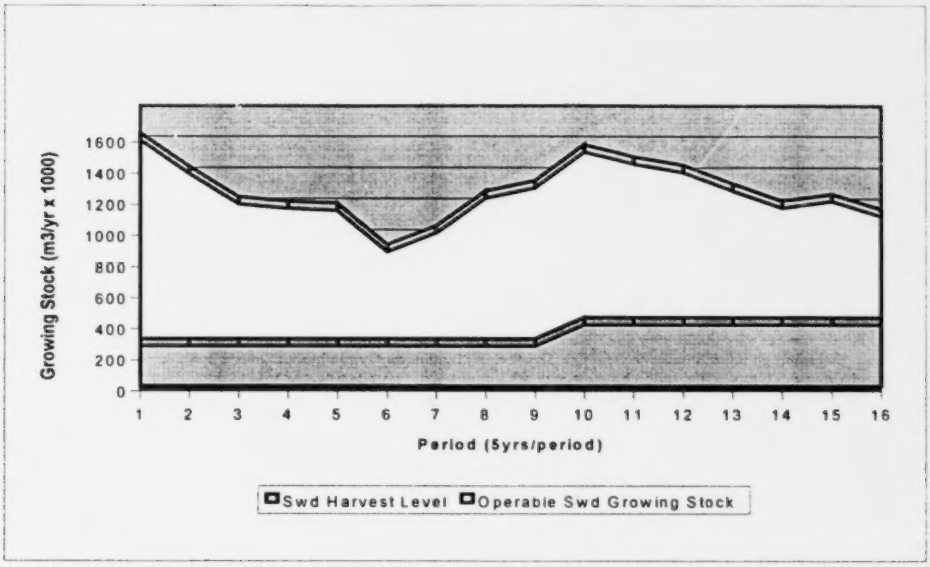

Figure 3.1 Spruce, Fir and Jack Pine operable growing stock and sustainable harvest level over the next 80-year planning horizon for License 2.

3.6.2 Hardwood Growing Stock

Figure 3.2 shows the level of hardwood growing stock over the next 80-year planning horizon along with the sustainable harvest level. As in the previous section, the shape of the growing stock has a typical profile for New Brunswick forest, whereby, the inventory steadily declines to a low point in period 6 and then rebounds. It is this low point that creates an impact on the current sustainable harvest level.

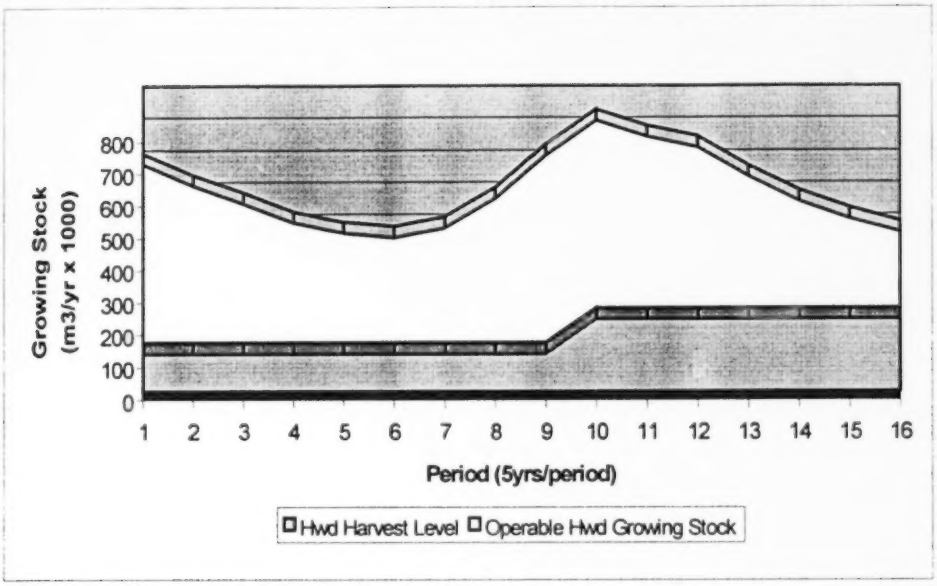

Figure 3.2 Hardwood operable growing stock and sustainable harvest level over the 80-year planning horizon for License 2.

3.7 SOFTWOOD DOMINATED STRATUM

3.7.1 Objectives

The management objective for the softwood-dominated stratum is primarily to meet all the non-timber objectives. Afterwards, the objective is to determine the maximum non-declining harvest level that can be sustained over the next 80-year time horizon. This will be achieved by harvesting the oldest and fastest declining stands first while implementing the appropriate levels of plantation and pre-commercial thinning.

3.7.2 Harvest Prescription

The softwood-dominated stratum is primarily composed of species that are mature and overmature. Consequently, the primary harvest method employed in the stratum throughout the 80-year planning horizon is clearcutting. With the younger forest constantly growing, there is also opportunity to utilize commercial thinning in managed softwood stands.

3.8 HARDWOOD DOMINATED STRATUM

3.8.1 Objectives

The hardwood portion of the forest is comprised of stands where, over their life, tolerant and intolerant hardwood species dominate, either by themselves or in mixtures with lesser amounts of softwood.

As per in the Softwood dominated stratum, the primary management objective for the hardwood-dominated stratum is to meet all non-timber objectives. Afterwards, the objective is to determine the maximum non-declining harvest level that can be sustained over the next 80-year time horizon. This will be achieved by setting a proper harvesting schedule while implementing the appropriate levels of pre-commercial thinning.

3.8.2 Harvest Prescription

As per in the softwood-dominated stratum, the primary harvest method employed in the stratum throughout the 80-year planning horizon is clearcutting. However, it is required that tolerant hardwood stands with potential for saw logs and veneer is managed using selection harvest techniques (Appendix XII).

3.8.2.1 Intolerant Hardwood Dominated Strata

Intolerant hardwood species are usually the first ones to grow after a clearcut. For that reason, there is usually no regeneration problem within the intolerant hardwood dominated strata after a clearcut. Therefore, the only harvest method employed in the stratum is clearcutting.

3.8.2.2 Tolerant Hardwood Dominated Strata

The actual policy regarding tolerant hardwood harvesting is to maximize the sustainable supply of hardwood logs from tolerant hardwood and tolerant hardwood-softwood stands while respecting other identified non-timber values. To do so, even-aged and uneven-aged techniques are being used.

All stands without actual or future potential for sawlog production and poor sites will be treated with clearcutting. All stands without actual or future potential for sawlog production but with medium or good sites will be evaluated at the operating plan level. The remaining stands will be treated with a Tolerant Hardwood Selection Cut treatment.

3.9 CEDAR DOMINATED STRATA

3.9.1 Objectives

The Cedar dominated strata form a relatively minor component of the General Forest on License 2. The objective is to manage the strata in a way to promote the Cedar regeneration as well as maximize the Cedar allocation from the stratum.

3.9.2 Harvest Prescription

In order to promote the Cedar regeneration in the Cedar-dominated strata, Strip Cuts will be used. Only the stands with an "EC" as Forest Community, stand composition of >=50% Cedar and a size greater than 5 ha will be treated.

It is important to mention that a large portion of the stands that were selected by the model for Cedar management may not be operable in the field. Various unpredictable reasons such as wet ground conditions and site sensitivity may jeopardize the operations. The technique used to manage these stands will be decided upon at the Operating Plan level. Furthermore, in order to consider the impact that this will have on the Cedar harvest level, the final Cedar AAC has been reduced by 50%.

3.10 PINE DOMINATED STRATA

3.10.1 Objectives

As per the Cedar dominated strata, the Pine dominated strata form a relatively minor component of the General Forest on License 2. The objective is to manage the strata in a way to promote Pine regeneration as well as maximize the Pine allocation from the stratum.

3.10.2 Harvest Prescriptions

In order to promote the White & Red Pine regeneration in the Pine-dominated strata, Shelterwood Cuts will be used. Only the stands with a PI as Forest Community, a stand composition of >=50% Pine and a size greater than 5 ha, will be treated.

It is important to mention that a certain portion of the stands that were selected by the model for shelterwood management may not be operable in the field. A decision will have to be made at the operating level in order to determine the treatment that should be applied to those stands.

3.11 HEMLOCK DOMINATED STRATA

On License 2, the Hemlock dominated strata is almost non-existent. For that reason, there is currently no management strategy for hemlock dominated strata in this plan.

4.0 OLD SOFTWOOD FOREST HABITAT

4.1 OBJECTIVES AND GENERAL DESCRIPTION

4.1.1 Background

Old spruce-fir habitat provides habitat for 56 vertebrate species. Thirty-four of those species are habitat-generalists and their habitat requirements are met in a variety of forest conditions including OSFH. The remaining 17 species require OSFH to meet their habitat requirements. The structural characteristics required to maintain these species include; tree cavities, woody debris, dead or dying trees and overstory crown closure. To meet this need on New Brunswick Crown land, an objective has been developed for OSFH (Old Spruce Fir Habitat).

4.1.2 OSFH Objectives

All of the habitat types have general spatial criteria, however, OSFH is one of them that is required to be spatially referenced and have specific spatial criteria (as they were for Mature Coniferous Forest Habitat). These criteria are as follows: (1) a minimum of 375 ha must meet stand-level criteria within each block, (2) a minimum of 75% of the area of each block must meet stand-level criteria, and (3) block widths must normally exceed 1000 meters and always exceed 500 meters.

The License 2 objective is to maintain no less that 10 percent of the conifer forest in a Net OSFH condition. The Net OSFH level to maintain over 35 years (7 periods) is 16 350 ha. The level of OSFH must also be maintained beyond the spatial planning horizon of 7 periods. Provision of spatially adequate OSFH beyond the spatial planning horizon requires that the

area of non-spatially referenced OSFH (Gross Habitat) exceed the area of spatially referenced objective (Net habitat). To that end, an objective exists for Gross OSFH for all planning periods beyond those spatially referenced as follows:

Gross OSFH Objective = Net OSFH (16350) X GNR

GNR = MinGross OSFH / Net OSFH

Where MinGross OSFH = the minimum gross OSFH level during the non-spatial planning horizon, and Net OSFH = the net OSFH level for the same planning period. For License 2, the Gross OSFH Objective, calculated at the non-spatial level, has been determined to be 36 604 ha.

4.2 OSFH MANAGEMENT STRATEGY

After analysis, the volume available from OSFH blocks has been determined to be very limited. Most of the volume has been located in economically inoperable isolated patches. Harvesting that volume without jeopardizing the OSFH situation within the blocks would also be extremely difficult. Furthermore, the overall habitat situation per block and License wise is very tight for the first few periods. Some of the blocks are barely meeting the required threshold and the overall Eco-region objective is not met in two Eco-regions. It is believed that any other openings or road construction would jeopardize the actual and future block structure. New openings would also limit any future adjustment to the blocks that might be required by new inventory, ages or yield information.

Considering the fact that some blowdown or natural mortality could be recuperated in some of the blocks, it was assumed that a minimum of 200 m^3/yr of Spruce, Fir & Jack Pine, as well as 70 m^3/yr of hardwood and 20 m^3/yr of Poplar would be available from those blocks.

4.2.1 NET OSFH AND WOOD SUPPLY SUMMARY

Table 4.1 provides a summary of the Net OSFH supply per Eco-Region on License 2 for the next 35 years. A summary of the Net OSFH supply per block can also be found in Appendix XIII.

Table 4.1 Net OSFH distribution by Eco-region for periods 1 to 7 (35 years)

Habitat Type	Eco-Region	Block Area (ha)	Period 1 Net OSFH	Period 2 Net OSFH	Period 3 Net OSFH	Period 4 Net OSFH	Period 5 Net OSFH	Period 6 Net OSFH	Period 7 Net OSFH	Target
>=72%[1]	1	6715	5421	5549	5625	5700	5741	5728	5751	4150
>=75%			5421	5549	5625	5700	5741	5728	5751	
Total			5421	5549	5625	5700	5741	5728	5751	
>=72%	2	6922	4518	5026	5093	5124	5567	5534	5547	6150
>=75%			4518	4612	5093	5124	5091	5047	5547	
Total			5075	5421	5495	5547	5567	5534	5547	
>=72%	3	602	492	492	493	493	493	493	493	1090
>=75%			492	492	493	493	493	493	493	
Total			492	492	493	493	493	493	493	
>=72%	6	8066	5886	6071	6088	6141	6675	6619	6532	4960
>=75%			5886	6021	6088	6141	6125	6069	6532	
Total			6339	6499	6577	6673	6675	6619	6532	
>=72%	All	22305	16317	17138	17299	17458	18475	18374	18323	16350
>=75%			16317	16674	17299	17458	17450	17337	18323	
Total			17327	17961	18190	18413	18475	18374	18323	

[1]In order to met the OSFH objectives by Eco-region, the net OSFH must be greater than 75%. After discussion with the DNR&E, it was agreed to use the level of 72%.

Considering the fact that some blowdown or natural mortality could be recuperated in some of the blocks, it was assumed that a minimum of 200 m^3/yr of Spruce, Fir & Jack Pine, as well as 70 m^3/yr of hardwood and 20 m^3/yr of Poplar would be available from those blocks.

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>=75%			492	492	493	493	493	493	493	
Total			492	492	493	493	493	493	493	
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Total			17327	17961	18190	18413	18475	18374	18323	

[1]In order to met the OSFH objectives by Eco-region, the net OSFH must be greater than 75%. After discussion with the DNR&E, it was agreed to use the level of 72%.

4.3 GROSS OSFH OBJECTIVE AND SUPPLY

Figure 4.1 depicts the next 80-year supply of Gross OSFH by Eco-regions along with the License Gross OSFH objective under the proposed forest management strategy.

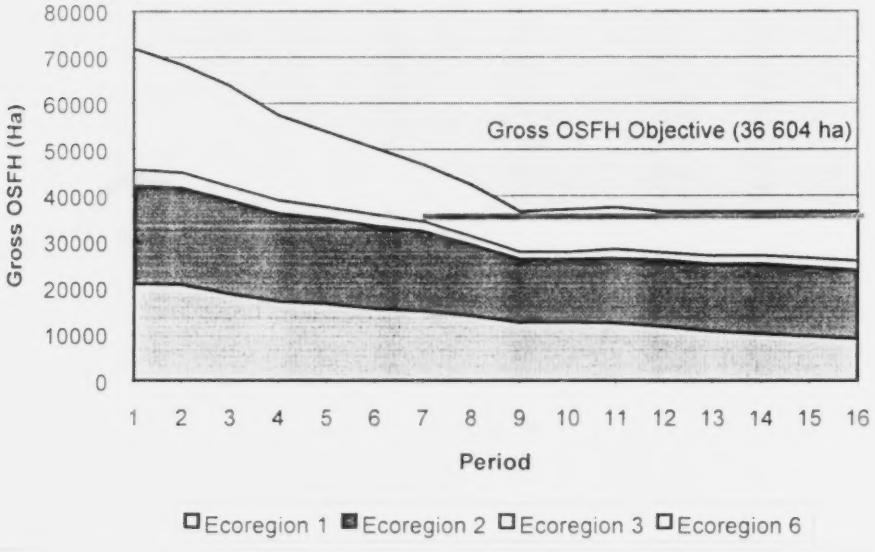

Figure 4.1 Gross OSFH supply by Eco-Region along with the Gross OSFH objective for License 2.

4.4 AGE CLASS STRUCTURE FOR OSFH

As depicted in Figure 4.2, the forest designated in the OSFH blocks is mainly composed of trees ranging from 70-105 years old. Therefore, as prescribed by the objective, the forest is predominantly in a mature age class. Areas are also represented in the young to immature and overmature stage of development as well.

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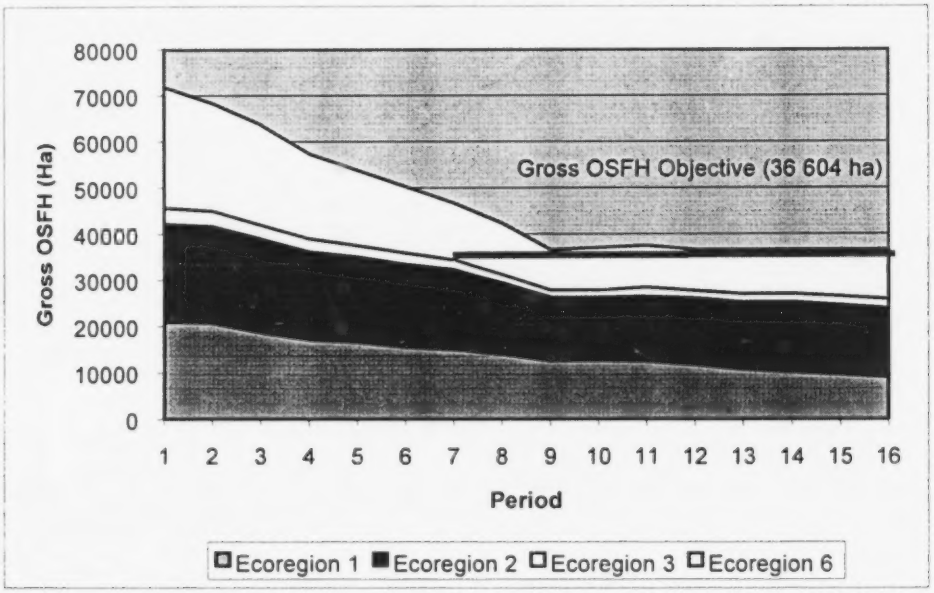

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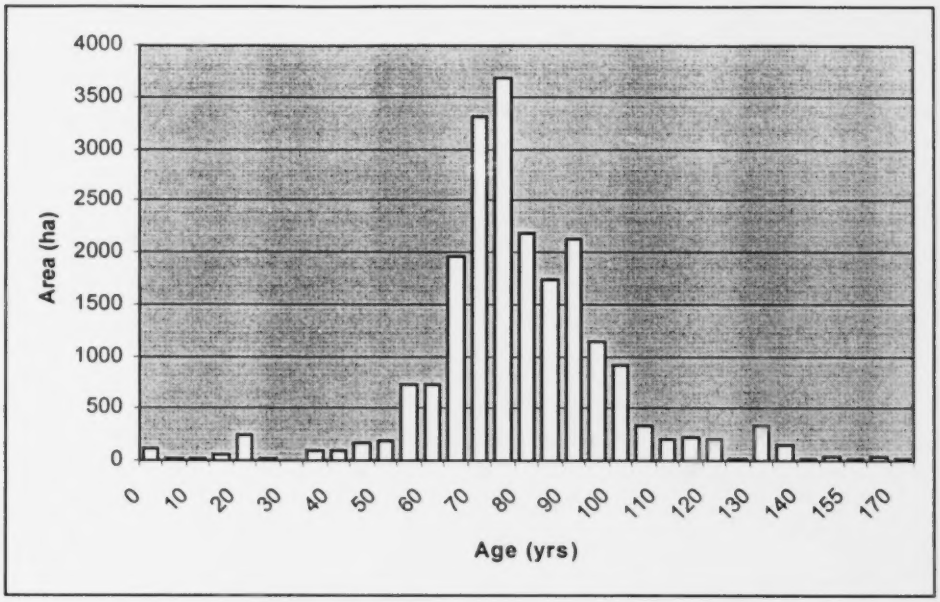

Figure 4.2 Age class distribution within the Old Spruce-Fir Habitat (OSFH) blocks.

5.0 DEER WINTERING AREAS

5.1 OBJECTIVE

As described in the document "A Vision for New Brunswick Forest", the Deer Wintering Areas management objective is to maximize deer winter habitat, with the intent to provide sufficient habitat to support deer population goals. More specifically, the two winter habitats identified are Severe Winter Deer Habitat (SWDH) and Moderate Winter Deer Habitat (MWDH). Ultimately, the objective of managing deer habitats is to meet stand level definitions on the ground. For that purpose, habitat windows are established on every yield curve used by this modeling process.

On License 2, the primary management objective with respect to deer wintering areas is to maximize the long-term sustainable supply of SWDH. The emphasis on moderate or severe habitat varies depending on the region's winter severity. The winter severity decreases from North to South and since License 2 is in the Northern region the severity is considered higher. Once the SWDH is maximized, the MWDH is then maintained as high as possible.

5.2 LANDBASE DESCRIPTION

The DWA landbase has been located through ground and aerial surveys by the DNRE. License 2 is composed of 83 Deer Wintering Areas (DWA) totaling 21 668 ha. From that landbase, 4 999 ha or four DWA's are being managed under approved Management Plans developed between 1997 and 2002 (Table 5.1). During the first period of this plan, 4 072 ha or 15 new DWA's are proposed for management plan development. (Table 5.2).

Table 5.1 DWA's under approved management plans between 1997 and 2002.

DWA Number	2002 Total Area (ha)	1997 Total Area (ha)	Year Initial Plan Approved
DW462002	825	825	2000
DW502202	87	87	1999
DW512201	1120	1122	1999
DW531901	2967	3677	1998
Totals	**4999**	**5711**	

Table 5.2 Proposed DWA's for initial management plan development between 2002-2007.

DWA Number	Total Area (ha)
DW492101	324
DW492301	112
DW502001	356
DW502002	44
DW502003	154
DW502101	533
DW502201	678
DW512101	202
DW512102	265
DW521601	223
DW532005	217
DW541901	95
DW542001	231
DW542104	541
DW562101	97
Totals	**4072**

5.3 HABITAT AND WOOD SUPPLY

As prescribed in Section 5.1, this Management Plan maximized the SWDH over time. Afterwards, the obtained habitat levels were hardwired in the model and the MWDH was then maximized over the planning horizon as well. As shown in Figure 5.1, an increase of SWDH is obtained in the last periods of the planning horizon. However, as shown in Figure 5.2, the MWDH was reduced for almost the entire planning horizon.

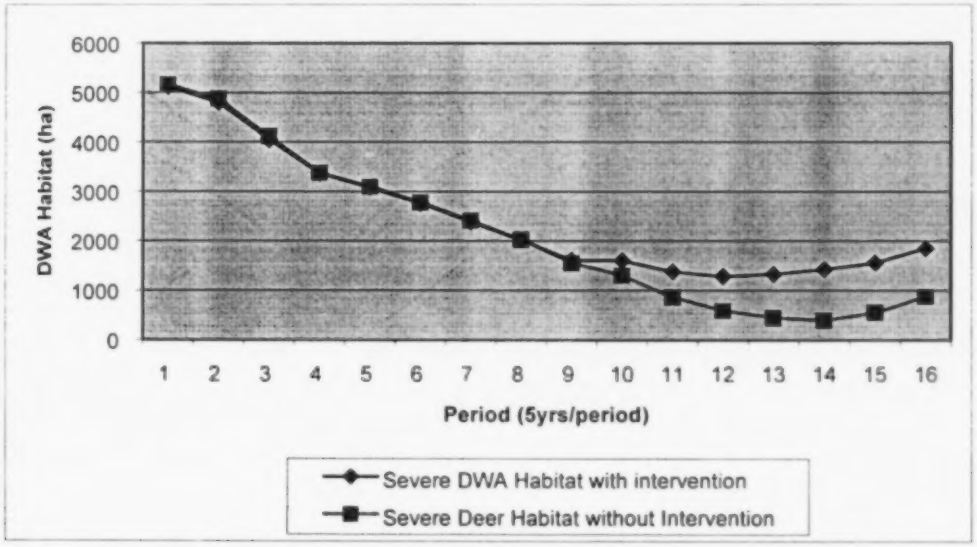

Figure 5.1 License 2 SWDH supply with and without intervention.

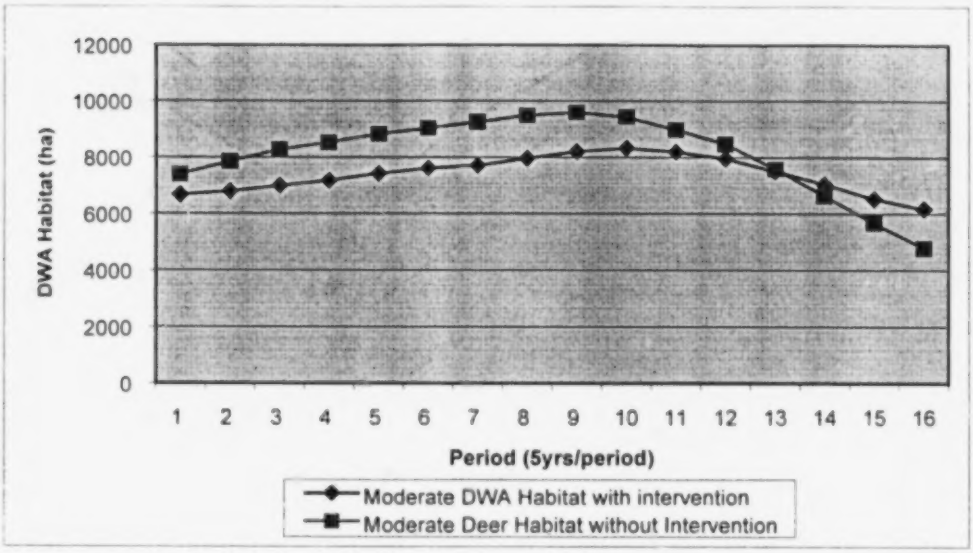

Figure 5.2 License 2 MWDH supply with and without intervention.

Table 5.3 is summarizing the total harvest volumes, harvest areas per treatment as well as the silviculture level for the next 6 periods within the DWA landbase. These levels were obtained while modeling with general photo interpretation inventory and average yield curves. However, before doing any treatment in a DWA, specific and individual Management Plans have to be developed for every DWA. These plans will be based on ground information and for that reason these levels might change.

Table 5.3 Non-spatial harvest volume, area and silviculture level within the License 2 DWA landbase for period 1 to 6.

Period	Harvest Level (m3/yr)			Harvest Area (ha/yr)					Silviculture Area (ha/yr)				
	SWD	HWD	POP	Clear Cut	Com. Thin.	Patch Cut			Plantation		Pre-Com. Thinning		
						1	2	3	Full	Fill	Swd.	Mxd.	Hwd.
1	13500	10389	1296	172	0	79	22	0	40	5	0	5	3
2	13500	6238	558	81	0	157	53	11	32	6	6	13	5
3	12458	2163	182	3	0	106	105	26	0	2	20	33	11
4	11019	1874	173	13	10	2	71	53	3	0	22	36	12
5	5695	861	41	7	28	0	1	35	1	0	16	27	10
6	2260	2049	207	31	16	0	0	1	5	1	4	8	4

6.0 WATERCOURSE BUFFERS

All watercourses on License 2 with a channel width of 0.5 meters and wider require a buffer strip to be established around them. Buffers are designed to protect both water quality and aquatic habitat.

6.1 HARVEST PRESCRIPTION

After analysis, the volume available from watercourse buffer zones has been determined to be very limited. The pre-dominant factors limiting accessibility are the operable basal area threshold, the overall buffers stability and canopy composition and finally, ground conditions such as wet or inoperable areas.

As described in figure 2.3, there are 20 427 ha of buffer zones on License 2. Out of that area, only 13 064 ha (64%) is considered unrestrained (not in a DWA, Inoperable, PAS or OSFH). From that area, 2 349 ha is classified within the BF Vegetative Community. Furthermore, another 2 501 ha is classified within BS, 1 843 within SP and finally, 744 ha within the SF Vegetative Community. A total area of 7 438 ha (57%) is then classified either as Balsam Fir, Spruce or a mixture of both. The rest of the area is classified in a mixture of hardwood, mixed wood, cedar, other softwood, pine and non-commercial Vegetative Communities.

A brief analysis was also done in order to establish the maturity status of the Balsam Fir and Spruce stands within the 7 438 ha. It was then determined that around 80% of that area is considered mature or overmature, which creates a great problem for stability during selection cut management. Furthermore, most of the stands within that age category are usually very

open and are showing evidence of decreasing volume and basal area. The areas that meets the actual basal area requirement are then very limited.

For all of the reasons mentioned above, UPM-Kymmene realizes that some buffers represent good management candidates and that some volumes may be accessible through their management. For that reason, it was decided to include a 200 m^3/yr Spruce, Fir and Jack Pine AAC from the buffer zones. A fallout volume of hardwood may also be available so 70 m^3/yr of hardwood and 20 m^3/yr of poplar were also included in this plan.

7.0 RECREATION

A requirement of the 2002 Forest Management Plan is the need to maintain the integrity of existing recreational sites. Recreation is an important component of the management of License 2 and is focused in the following 10 main areas:

- California Lake
- Rainbow Falls
- Buck Falls
- Indian Falls Depot
- Indian Falls
- Mont Fronsac
- Mathias Landing
- TV Tower
- Devil's Elbow
- Portage Brook
- Pentland Brook

More detailed information as well as a map showing the location of these areas can be found in Appendix III. As per the 1997 plan, one of the company's objectives was to favor canoeing and hiking along the Nepisiguit River. Most of the site establishment was done during the summer of 1996 and the work was focused from McEwen Bridge to TV Tower landing. Signs indicating the landing sites were installed at the main road, at the sites themselves and 100 meters before the sites on the river. Metal fireplaces and cedar benches were also installed in many landings.

As part of an on going project with the First Nations, UPM-Kymmene is supporting the development of the MI'GMAG trail from Pabineau Falls to Mount Carleton. The trail has been under construction for several years and is mainly located along the Nepisiguit River.

UPM-Kymmene is offering technical and staff support to the First Nations in order to produce GPS and other types of maps as needed for the trail construction.

Throughout the winter, many forest and logging roads are being used by a multitude of snowmobiles. However, in order to fulfill our management activities, snow removal has to occur in a certain number of roads. In order to minimize the impact of our activities on the snowmobile sport, constant communication and cooperation takes place between UPM-Kymmene and the New Brunswick Snowmobile Federation.

8.0 UNIQUE SITES

Unique sites include areas of ecological, historical, cultural or scenic value. Currently, no site has been formally identified by DNR&E on Crown Land License 2. However, the Emery's Gulch areas, located on License 2 and 4 has been deliberately protected by UPM-Kymmene. For that reason, no harvest blocks as well as any other type of management treatment were scheduled in that area.

Since the 1997 plan, two protected areas were put in place on License 2. The areas include a portion of the Jacquet River Gorge and the Mt. Carleton Extension. More information can be found on those areas throughout this document, especially in the section 1.3.2.2, section 2.1.1 and section 10.2.2.

9.0 LONG TERM FOREST INDICATORS

9.1 VEGETATION AND OLD HABITAT COMMUNITY OBJECTIVES

Table 9.1 depicts the achieved levels of Vegetation Communities over the next 80-year planning horizon. As per the non-spatial plan, it was not possible to meet the objective for the SP Vegetation Community in Eco-region 1 and 2 for the entire planning horizon. It was also not possible to meet the objective for the THSW Vegetative Community in all Eco-regions for some of the initial periods.

Since the objective of SP in Eco-Region 1 and 2 is not achievable at any time in the planning horizon, optimization runs were done at the as-spatial level in order to maximize their levels. Even if only a small gain was obtained, the new numbers were accounted in the model.

In order to make sure that the levels of limited SP and THSW stay at the identified levels, they have to be traceable. For that reason, all the stands that are actually or that will eventually be SP in Eco-regions 1 and 2 as well as THSW in all Eco-regions will be color coded on the Operating Plan and Management Plan maps.

Table 9.1 Vegetation community objectives and levels achieved over the 80 year planning horizon on License 2.

For. Com	Eco reg.	Obj.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
BF	1	2210	10948	9651	8688	8380	8101	7909	7195	6315	6279	6320	6423	6466	6532	6243	5438	4711
	2	3890	7897	6822	6208	6030	5855	5835	4991	4501	4324	4388	4966	5081	5288	5136	5130	4999
	3	330	1165	1095	850	868	903	866	725	481	481	843	562	595	600	560	622	629
	6	670	1485	1169	957	829	729	746	766	670	1043	807	790	1106	1102	1241	1400	1249
BS	1	1170	8587	7954	7243	7039	6409	6158	5916	5271	5350	5335	5347	5314	5402	5350	5101	4935
	2	690	5874	5953	5790	5552	5383	5346	4992	4028	3969	3915	3909	4041	4240	4352	4293	4252
	3	90	531	580	578	423	391	321	286	309	322	322	324	325	330	422	427	455
	6	4460	12770	11618	9761	8849	8246	7380	6772	4878	4840	4653	4600	4568	4540	4569	4571	4460
CE	1	0	276	272	258	251	227	223	208	205	200	200	195	180	185	183	186	194
	2	610	2996	2921	2719	2567	2424	2247	1903	1749	1662	1580	1494	1472	1480	1463	1436	1402
	3	70	221	194	180	167	167	143	118	117	112	112	112	114	104	104	104	110
	6	320	1764	1692	1469	1297	1178	1068	952	867	828	827	776	773	706	642	575	320
JP	1	700	1414	1125	1103	829	1983	1150	1199	1059	1045	1141	1108	1097	1107	1015	948	893
	2	0	253	232	179	166	104	101	95	71	87	95	94	93	89	90	85	74
	3	90	278	261	298	544	402	115	107	107	135	146	128	115	114	113	109	104
	6	430	537	1421	1579	1101	979	430	430	430	469	492	458	440	434	430	430	430
PI	1	110	1233	1107	1011	984	953	947	816	767	760	721	614	601	595	442	442	433
	2	0	440	401	355	344	332	336	369	338	287	263	255	248	248	211	211	210
	3	0	36	14	16	13	9	9	19	36	27	13	13	13	13	13	12	12
	6	60	336	329	316	272	246	179	205	158	121	121	121	66	63	72	72	60
SP	1	1670	876	906	915	936	940	940	940	940	947	964	968	967	970	973	956	869
	2	3140	1835	2171	2316	2417	2477	2477	2495	2569	2603	2627	2632	2643	2649	2600	2641	3140
	3	540	1406	1088	1212	1045	945	748	599	577	568	567	566	569	582	591	589	583
	6	2060	5603	5694	4900	4169	3342	2290	2150	2060	2060	2060	2060	2085	2159	2123	2077	2060
THP	1	0	523	527	570	589	538	544	542	542	552	546	529	528	528	504	504	505
	2	940	2101	2188	2522	2838	3121	3500	3806	3847	4028	3948	4010	4053	4040	3941	3887	3887
	3	0	62	121	147	147	157	157	126	117	120	110	219	192	170	160	160	160
	6	0	299	340	335	322	403	447	417	580	600	571	574	629	655	734	743	741
THSW	1	480	228	240	373	424	481	501	512	480	490	485	487	487	487	480	480	480
	2	1730	1297	1499	1581	1676	1795	2023	1965	2029	2485	2604	2738	2848	3063	3068	3050	3015
	3	130	51	57	98	135	167	182	164	225	219	200	199	273	285	217	130	130
	6	720	494	619	696	755	753	808	793	759	766	720	720	720	720	733	756	720

* Numbers in blue are below the objectives.

Table 9.2 describes the achieved levels of Old Habitat over the next 80-year planning horizon on License 2. As per the non-spatial plan, it was not possible to meet the objectives for the OTHH in Eco-region 3 and LMWH in Eco-region 2 and 6 for some of the initial periods.

In order to make sure that the levels of limited OTHH and LMWH stay at the identified levels, they have to be traceable. For that reason, all the stands that are actually or that will eventually be OTHH in Eco region 3 as well as LMWH in Eco-Region 2 will be color coded on the Operating Plan and Management Plan maps. Since a few hectares only are missing for LMWH in Eco-Region 6, it was not judged necessary to color code the stands on the maps.

Table 9.2 Objectives and spatial supply of six habitat types by Eco-region on License 2.

Habitat Type	Eco-Region Thresholds (ha)		Projected Habitat Supply (ha) by Eco-region and 5 year Management Period														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Old Hardwood Habitat	1	180	4444	4475	4254	4456	4069	3827	3614	3511	3618	3611	3761	3863	4066	4056	3961	3786
	2	730	4706	5330	5871	6176	6602	7239	7219	7371	8492	8735	9300	9781	10004	10435	10752	10637
	3	60	417	493	508	519	523	510	421	455	477	461	631	704	722	650	574	559
	6	340	3877	4219	3799	3441	3021	2765	2278	2213	2293	2249	2503	2567	2619	2924	3055	2914
Old Tolerant Hardwood Habitat	1	500	751	767	944	1012	1019	1045	1054	1022	1042	1032	1016	1015	1015	984	984	985
	2	1650	3398	3687	4103	4514	4916	5523	5771	5875	6513	6551	6747	6901	7103	7009	6938	6902
	3	290	113	177	246	282	324	340	290	342	339	310	418	465	455	377	290	290
	6	410	794	960	1031	1077	1155	1255	1209	1339	1366	1291	1294	1349	1375	1467	1498	1461
Old Spruce-Fir Habitat[1]	1	4150	20687	18763	17085	16586	15573	15042	14047	12535	12628	12450	11680	10720	10217	9662	9041	8682
	2	6150	20980	20250	19095	18435	17836	17296	15402	13824	13638	13940	14364	14468	15061	14934	14795	15484
	3	1090	3322	2958	2819	2503	2402	2063	1727	1462	1498	2037	1610	1726	1728	1816	1992	1945
	6	4960	23359	21731	18391	16276	14494	12349	11141	8783	9241	9021	8951	9690	9598	10193	10776	10493
Old Pine Habitat	1	0	1233	1107	1011	984	953	947	816	767	760	721	614	601	595	442	442	433
	2	0	440	401	355	344	332	336	369	338	287	263	255	248	248	211	211	210
	3	0	36	14	16	13	9	9	19	36	27	13	13	13	13	13	12	12
	6	0	336	329	316	272	246	179	205	158	121	121	121	66	63	72	72	60
Old Mixedwood Habitat	1	1570	7926	7760	7224	7331	6850	6509	6203	5847	5792	5359	4927	4382	4200	3717	3356	3006
	2	3230	7581	7420	6995	6638	6482	6406	5577	5619	6064	6216	7003	7198	7353	7365	7439	7230
	3	620	1151	1142	970	968	885	826	705	620	627	717	704	793	770	625	622	621
	6	1840	6861	6396	5340	4644	4096	3633	3027	2631	3114	2684	2929	3255	2956	3209	3374	3046
Large Mixedwood Habitat	1	220	2296	2634	2638	2808	3006	2891	2862	2908	3082	3144	2990	2887	2666	2531	2114	1840
	2	440	131	227	300	375	428	490	444	440	440	440	440	523	695	970	1121	1264
	3	100	98	90	153	151	178	172	137	100	116	121	122	122	137	139	191	204
	6	300	1937	1893	1598	1430	1106	944	874	699	730	780	774	707	710	705	785	814

[1]Old Spruce-fir has a spatial objective that applies for periods 1 to 7.
* Numbers in blue are below the objectives.

9.2 PIECE SIZE

Piece size refers to the average stem diameter of harvested trees and is important to monitor because of its impact on the sawmill industry. As Figure 9.1 and 9.3 illustrates, the Spruce, Fir and Jack Pine piece size will be at its lowest level in period 4. Afterwards, it will slightly increase to be reduced again a few periods later. As noticed in figure 9.1, the Spruce, Fir and Jack Pine piece size is stable from period 10 to 16. The main reason for this is that the model was constrained to maximize the harvest level with a minimum average Spruce, Fir and Jack Pine piece size of 12. A similar situation describes the Hardwood piece size (Figure 9.2 and 9.4), however, the minimum average has been set to 10.

Figures 9.2 and 9.4 should not be used in comparison with the total AAC. The volume figures would not match since some of the piece size information is missing on some curves thus cannot be reported in Figure 9.2 and 9.4. However, they both give a really good indication of how much volume will be harvested in different piece size classes in the future.

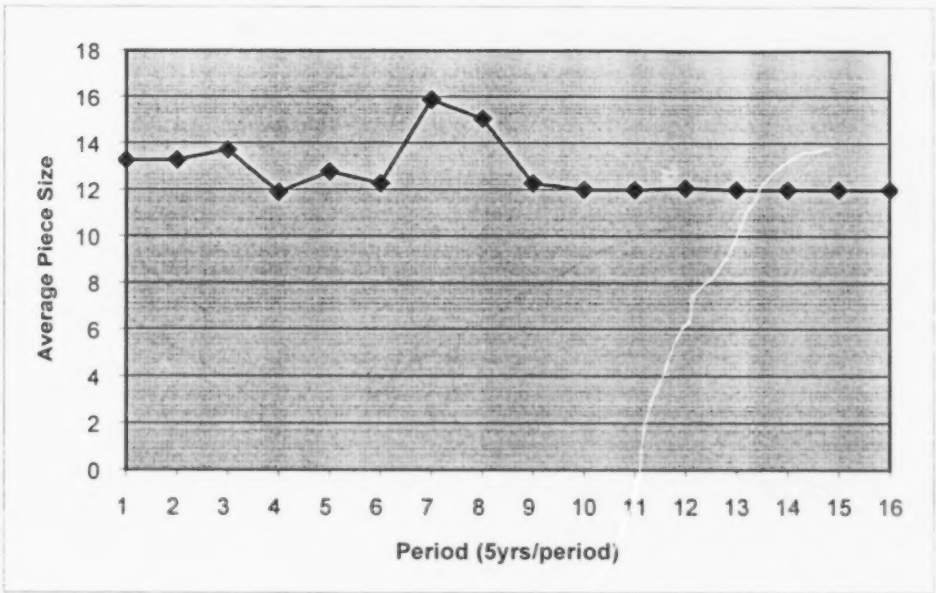

Figure 9.1 Spruce, fir and jack pine harvested average piece size distribution for License 2.

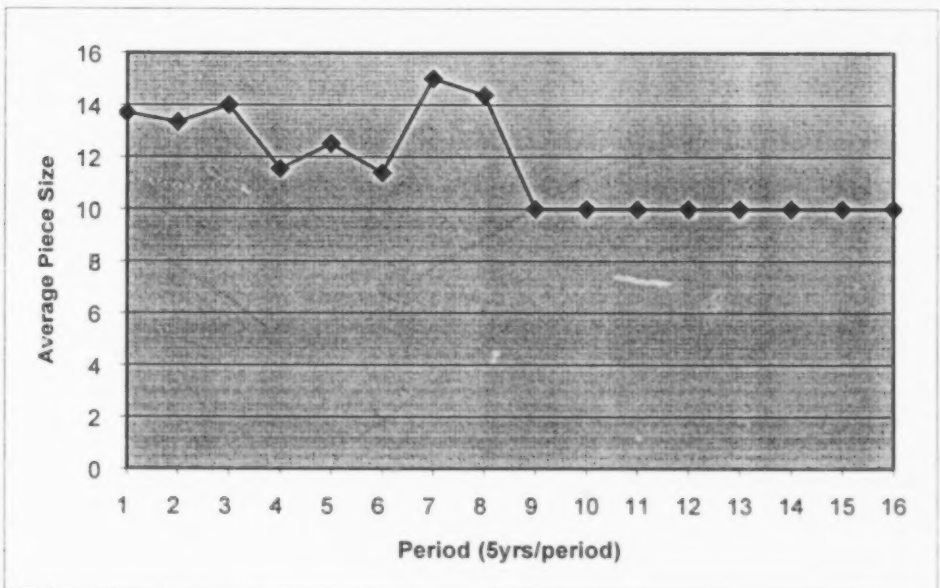

Figure 9.2 Hardwood harvested average piece size distribution for License 2.

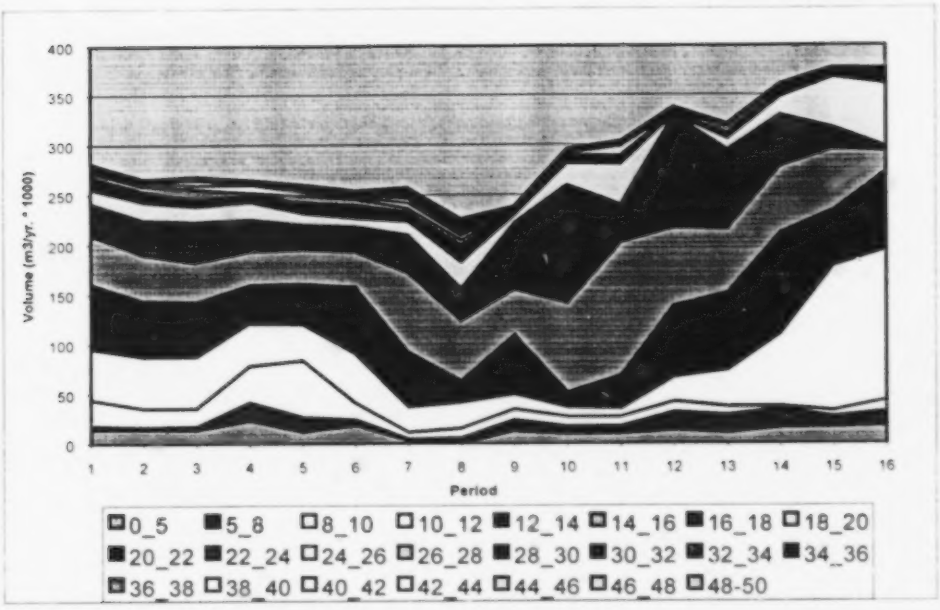

Figure 9.3 Spruce, fir and jack pine total harvested volume distribution by average piece size Clases for License 2.

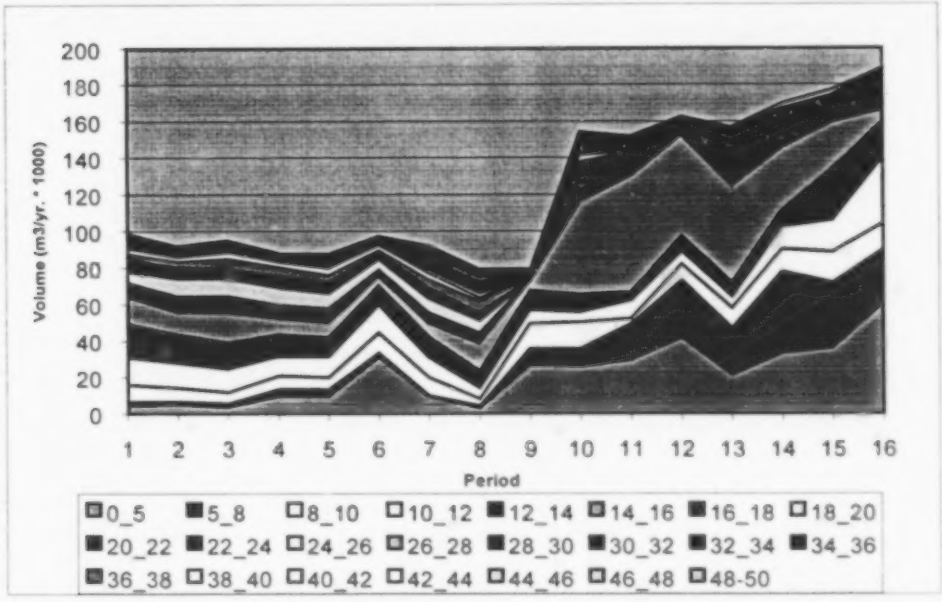

Figure 9.4 Hardwood total harvested volume distribution by average piece size class for License 2.

9.3 HARVEST PRESCRIPTIONS

As detailed in earlier sections of this Management Plan, a variety of harvesting prescriptions will be employed on License 2 over the next 80 years. As shown in Figure 9.5, during the next 80-year planning horizon, harvesting of the softwood volume in the general forest will be dominated by clear cutting. However, after 15 years, more volume will be generated through commercial thinning. Figure 9.6 is also showing that the harvesting of Hardwood in the General Forest is also dominated by clear cutting. However, selection cuts in tolerant hardwood stands also compose a small but important part of the allocation.

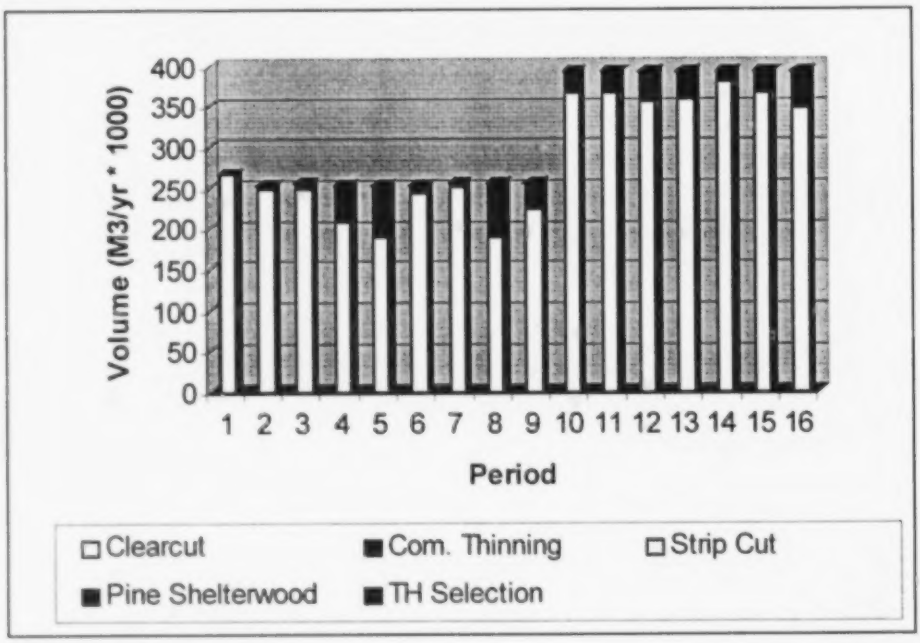

Figure 9.5 General Forest Spruce, Fir and Jack pine volume distribution over time by harvest treatment on License 2.

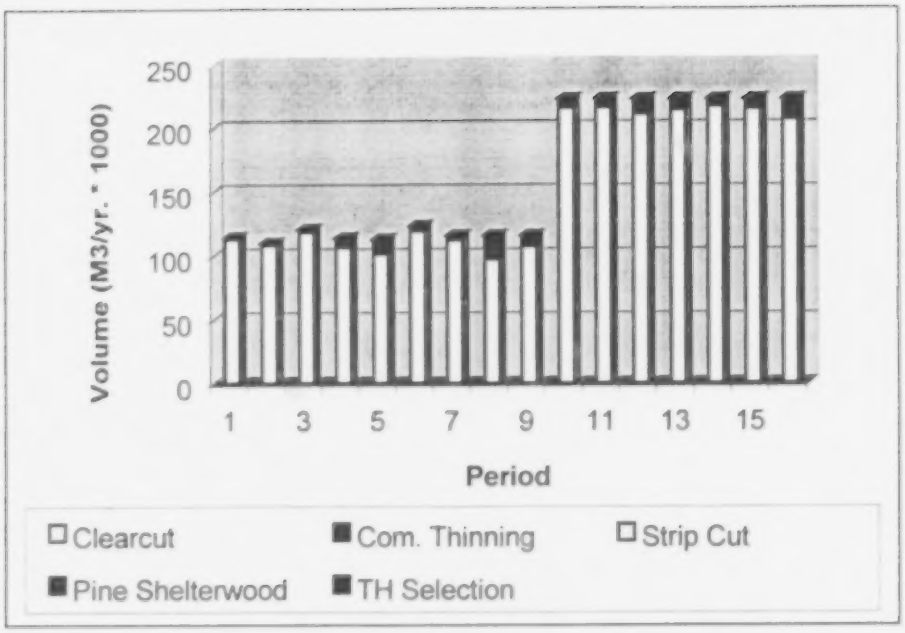

Figure 9.6 General Forest Hardwood (Hardwood + Poplar) volume distribution over time by harvest treatment on License 2.

10. SUMMARY AND DISCUSSION

10.1 PROBLEMS ARISING SINCE THE 1997 MANAGEMENT PLAN

The current cycle of the forest inventory on License 2 is a concern towards management planning. License 2 is actually split into three zones with each a different photo interpretation cycle. One zone, more precisely located in the Acadian Peninsula wasn't inventoried since 1984 and 1985. A new set of photos will be taken in 2002 and GIS information should only be available by 2004. By then, the inventory on the rest of the License will almost be 10 years of age. Such a difference is causing problems in forest stratification, age distribution as well as in the yield curves construction process.

10.2 SUMMARY OF MAJOR CHANGES FROM 1997 TO 2002

10.2.1 Yield Curves

In 1995 and 1997, a new inventory covering approximately 80% of License 2 was done. The new information redefined the composition and the distribution of all the photo-interpreted stands on the License. To acquire quantitative stand data such as volume, density and age by individual species, a new set of Forest Development Surveys (FDS) was established.

In order to reflect the new information, a new set of growth and yield curves had to be developed. In comparison with the 1997 set, the new curves were in some cases much different in yield and shape.

10.2.2 Protected Area Strategy (PAS)

In March 1997, Dr. Louis LaPierre of the University of Moncton, was asked by the Department of Natural Resources and Energy to develop a Protected Areas Strategy for New Brunswick. Dr. LaPierre named a working group to assist him in developing the strategy and proposed different scenarios. The favored scenario included two protected areas on License 2; Mount Carleton Extension and Jacquet River Gorge.

10.2.3 Aesthetic buffers

Since 1997, a new regulation was passed on Crown Land in order to respect a 30-meter buffer along any numbered roads in the province. Since then, a new buffer zone was added in the Geographic Information System (GIS) and is now respected in the field. The newly created buffer zone is slightly associated to the AAC reduction.

10.2.4 New harvest treatments

The 1997 plan was using clearcut and commercial thinning as it's only harvesting treatments. In this plan, new treatments such as Cedar Strip cuts, Pine Shelterwood, Tolerant Hardwood Selection cuts and Deer Wintering Areas Patch cuts were added to the list of harvesting treatments.

10.2.5 Modeling

In 1997, the model FORMAN+1 was used in order to run the computer simulations. Since the model was a simulator, a large number of runs had to be made in order to make sure

all the objectives were met. The process was trial and error and the final product was the best answer that it is humanly possible to get with a simulator. In this plan, the model WOODSTOCK version 2.5 was used. WOODSTOCK is a linear optimizer that maximizes the desired objective while respecting some constraints. The results are then always optimized and it is much easier to analyze different scenarios.

10.3 COMPARISON OF 2002 RESULTS TO 1997

As described in this Management Plan, the final Spruce, Fir and Jack Pine harvest level from the General Forest was reduced to 255 333 m^3/yr and the hardwood level was increased to 127 458 m^3/yr (Table 10.1). For the softwood, it represents a 8.7% decrease and for the hardwood, it is a 29.0% increase (Table 10.2).

Table 10.1 Period 1 harvest level comparison between the 1997 and 2002 Spatial Forest Management Plan.

Landbase	Softwood (m^3/yr)		Hardwood (m^3/yr)		Cedar (m^3/yr)		Pine (m^3/yr)	
	1997	2002	1997	2002	1997	2002	1997	2002
General Forest	279 650	256 614	98 780	115 931	11 861	7 963	6 212	5 215
Buffers	1 800	200	169	90	55	0	50	0
DWA	10 793	13 500	13 293	11 685	368	723	380	457
Inoperable	0	1000	0	450	0	0	0	0
MCFH/OSFH	0	200	0	90	0	0	0	0
Total	**292 243**	**271 514**	**112 242**	**128 246**	**12 284**	**8 686**	**6 642**	**5 672**

Table 10.2. Period 1 harvest level comparison in percentage between the 1997 and 2002 Spatial Forest Management Plan.

Landbase	Softwood (% difference)	Hardwood (% difference)	Cedar (% difference)	Pine (% difference)
General Forest	-8.2%	+17.4%	-32.9%	-16.0%
Buffers	-88.9%	-46.7%	-100%	-86.0%
DWA	+25.1%	-12.1%	+96.5%	-20.3%
MCFH/OSFH	+100%	+100%	0%	0%
Inoperable	+ 100%	+ 100%	0%	0%
Total	-7.1%	+14.3%	-29.3%	-14.6%

In Comparison with the 1997 Plan, the final 2002 Forest Management Plan is also presenting some differences in the silviculture levels. As described in Table10.3 the total level of plantation went up by 25% and the total level of Pre-commercial Thinning also went up by 28%.

Table 10.3 Period 1 silviculture level comparison in the General Forest between the 1997 and 2002 Spatial Forest Management Plan.

Silviculture Treatments	1997 (ha/yr.)	2002 (ha/yr.)	2002 (ha/yr.)
Full Plantation	480	650	+35%
Fill Plantation	120	100	-17%
Total Plantation	*600*	*750*	*+25%*
Swd. PCT	500	367	-27%
Mwd. PCT	400	632	+58%
Hwd. PCT	112	298	+166%
Total PCT	*1012*	*1297*	*+28%*